

2008 Yearbook



January 2009

Dear Sir or Madam,

We wish you a happy and less challenging New Year. This past year has seen some of the most dramatic events in the history of financial markets. At MSCI Barra, we have executed on a number of important developments.

First, this past year heralded the launch of the new and enhanced Barra Global Equity Model (GEM2). The enhancements leverage years of research, extensive investor consultations, and a broader estimation universe based on our high quality MSCI Equity Indices data to create a powerful and intuitive risk model. GEM2 provides improved portfolio risk forecasts and better explanatory power of the sources of portfolio return. Importantly, GEM2 is more responsive to market trends due in part to the use of higher frequency data. In addition, the model reflects the increasing globalization of equity markets and does not impose a hierarchy on country or industry effects on global portfolios.

Emerging Markets have been an area of focus during this past year. We celebrated the 20th anniversary of the MSCI Emerging Markets Index, expanded the country coverage of our MSCI Frontier Markets Indices and launched a comprehensive review of the classification of countries in Developed, Emerging and Frontier Markets. In addition, we released the MSCI Thematic & Strategy Indices offering liquid proxies of illiquid asset classes such as the MSCI Infrastructure Indices or reflecting certain strategies such as the MSCI Global Minimum Volatility Indices. The MSCI Global Minimum Volatility Indices are the first MSCI indices that leverage the Barra risk models for the index construction. We also introduced our first currency indices, the MSCI Global Currency Indices, measuring the total investment performance of foreign currencies: Currency appreciation/depreciation and interest earned.

In this issue of the MSCI Barra Yearbook, we present a collection of new and recently published research papers, as well as a review of the equity markets through the lenses of MSCI Equity Indices. The papers illustrate the breadth of our current research efforts at MSCI Barra and cover topics ranging from global investing and alternative approaches to asset allocation, to portfolio construction and risk management. Two of the articles in this Yearbook discuss risk and performance characteristics of Emerging and Frontier Markets as well as the MSCI Global Minimum Volatility Indices mentioned above. In addition, we present abstracts of papers published by our colleagues in various leading academic journals not included here.

We hope this publication is a useful reference for understanding the investment trends of 2008 and offers insights into various aspects of risk management and portfolio construction relevant to your own investment process.

Sincerely,

A handwritten signature in black ink, appearing to read "Remy Briand". The signature is fluid and cursive, with the first name "Remy" written in a larger, more prominent script than the last name "Briand".

Remy Briand
Managing Director,
Global Head of Index and Applied Research

CONTENTS

Abstracts	1
The World is Not Enough? Expanding the Boundaries of International Equity Indices for International Investing	4
Do Risk Factors Eat Alphas?	16
Far From the Madding Crowd –Volatility Efficient Indices	29
Portfolio of Risk Premia: A New Approach to Diversification	39
Emerging Markets: A 20-year Perspective	49
Index Review	61

Editorial Board

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Abstracts

Yearbook Contents

Abstracts for the articles in this Yearbook appear below along with the journals in which they were published.

The World is Not Enough? Expanding the Boundaries of International Equity Indices for International Investing by Arun A. Kumar

Risk diversification combined with the pursuit of additional sources of return has been a major driver for institutional investors venturing into international markets. The MSCI Europe, Australasia and Far East (EAFE) Index has been a dominant benchmark for US-based institutional investors seeking international diversification. In this paper, using the MSCI EAFE Index as the international component, we first document how international investing has provided diversification benefits. We then introduce the additional segments – Emerging Markets and Small Caps – covered by the MSCI All Country World Investable Market Index (ACWI IMI) and discuss their risk-return profile and their role in furthering international diversification. We also describe the advantages of using MSCI ACWI IMI as the benchmark for strategic allocation and in performance benchmarking of mandates based on segments of it.

Do Risk Factors Eat Alphas? By Jyh-Huei Lee and Dan Stefek

[Published in *The Journal of Portfolio Management*, Summer 2008]

Although widespread, the practice in portfolio optimization of using different factor models for risk and alpha has potential pitfalls. Discrepancies between risk and alpha factors can create unintended exposures in optimized portfolios that may hamper performance. An analysis reveals the root of the problem. The optimizer emphasizes the portion of the manager's alpha that is not captured by the risk factors. Aligning the risk and alpha models may lead to better portfolios, even if doing so worsens the overall risk forecasts. In this article, four ways of remedying these problems are presented and compared using familiar optimization problems.

Far From the Madding Crowd – Volatility Efficient Indices by Raman Aylursubramanian and Frank Nielsen

Minimum-variance and managed volatility equity strategies have been around since the early 1990s but have recently gained popularity. Since minimum variance strategies do not require return forecasts, they may be in some cases more efficient than strategies that trade off expected risk and return. Moreover, new pension regulations in the US and abroad have led to increased aversion against asset volatility. We developed a global minimum volatility index that can serve as a transparent and relevant benchmark for managed volatility equity strategies. Our MSCI Global Minimum Volatility Index performance profile is consistent with earlier studies of minimum variance portfolios for US and European markets. The simulated MSCI MV World Index experienced approximately 30% lower volatility than the MSCI World Index over the period January 1995 to October 2008. Its performance, measured by the Sharpe ratio, was 0.34 vs. 0.17 for the MSCI World Index during this period.

Portfolio of Risk Premia: A New Approach to Diversification by Remy Briand, Frank Nielsen, Dan Stefek

Traditional approaches to structuring policy portfolios for strategic asset allocation have not provided the full potential of diversification. Portfolios based upon a 60/40 allocation between equities and bonds remain volatile and dominated by equity risk. In this paper, we introduce a different approach to portfolio diversification. This approach looks at structuring portfolios using available risk premia within the traditional asset classes or from systematic trading strategies, rather than focusing on classic betas such as equities and bonds. We start by reviewing the various ways of dissecting asset classes into their underlying systematic drivers or risk premia, and analyze the historical risk and return

patterns for a number of risk premia across asset classes. In a second stage, we illustrate empirically that correlations between risk premia have been low, offering significant diversification potential. We then confirm the benefits of diversification with a simple asset allocation case study by comparing a typical 60/40 equity/fixed income allocation with an equal weighted allocation across eleven style and strategy risk premia. From 1995 to 2008, this simple combination had returns similar to the traditional allocation but with 65% less volatility.

Emerging Markets: A 20-year Perspective by Remy Briand and Madhusudan Subramanian

[Published in The Journal of Indexes, September/October 2008]

In the context of the 20-year anniversary of the MSCI Emerging Markets Index, we review the evolution of equity markets over the last two decades and examine the various drivers of risk and returns for emerging markets. Over this period, strong economic growth combined with the development of financial markets has dramatically increased the opportunity set available to international institutional investors. Early emerging markets investors that identified this growth potential have benefited tremendously from these developments, albeit at the expense of higher volatility. The road to emerging riches has been bumpy, featuring regular and meaningful crises. This prominence of the country factor, which has driven most of common stock volatility in emerging markets, explains the higher volatility compared to developed markets. With that background, we revisit the concept of GDP-weighted indices as an alternative to capture the country factor.

Additional Papers

In addition, researchers at MSCI Barra published numerous articles in third-party publications which we could not reproduce here. The following lists some of these papers and their citations. Reprints of these papers can be obtained upon request from us.

Beyond Value-at-Risk: Forecasting Portfolio Loss at Multiple Horizons, by Lisa Goldberg, Guy Miller, and Jared Weinstein

[Published in the Journal of Investment Management, Vol. 6, No. 2, 2008]

We develop a portfolio risk model that uses high-frequency data to forecast the loss surface, which is the set of loss distributions at future time horizons. Our model uses a fully automated, semi-parametric fitting procedure that has its basis in extreme value statistics. We take account of distributional asymmetry, heavy tails, heteroscedasticity, and serial correlation. Loss distributions are time aggregated by taking products of characteristic functions. We test loss-surface-implied forecasts of value at risk and expected shortfall out of sample on a diverse set of portfolios and we compare our forecasts to industry-standard risk forecasts that are based on asset and factor covariance matrices. The empirical results make a compelling case for the application and further development of our approach.

Custom Factor Attribution, by Jose Menchero and Vijay Poduri

[Published in Financial Analysts Journal, Vol. 64, No. 2, 2008]

Portfolio analysts often use one set of decision variables for attributing portfolio returns and a different set for attributing risk. This practice obscures the relationship between the sources of risk and return. This article demonstrates how to align the attribution model with the investment process. The attribution methodology can be applied ex ante or ex post. A factor-based investment process illustrates the general framework. Specifically, active return, tracking error, and the information ratio are attributed to a user-defined set of factors that reflect the manager's investment decision-making process. A concrete example with actual market data, a style portfolio, and a parsimonious set of custom factors illustrates how to apply the analysis.

How Much Structure Is Best? A Comparison of Market Model, Factor Model and Unstructured Equity Covariance Matrices, by Beat Briner and Gregory Connor

[Published in The Journal of Risk, Vol. 10, No. 4, Summer 2008]

This paper compares three approaches to estimating equity covariance matrices: a factor model, a market model and an unstructured asset-by-asset model. These approaches make different trade-offs between estimation variance and model specification error. We explore this trade-off with a simulation experiment and with an empirical analysis of UK equity portfolios. The factor model is found to perform best for large investment universes and typical sample lengths. The market model underperforms due to excessive specification error while an asset-by-asset model with a short half-life of 22 days underperforms due to high estimation variance. The importance of properly accounting for serial correlation is highlighted.

A Structural Analysis of the Default Swap Market, Part 1 (Calibration), by Lisa Goldberg, Rajnish Kamat, and Vijay Poduri

[Published in The Journal of Investment Management, Third Quarter, 2008]

We analyze the default swap market with the two factor I2 structural model which is driven by firm value and firm leverage. This paper describes a cross-market model calibration process which results in close alignment of our model spreads with the market. This enables us to extract systematic effects reflected in the dynamics of average levels of model inputs and outputs, and discern relative value among credits by analyzing model residuals. Applications of our model, including assessment of relative value, pricing of illiquid names, cross market hedging and monitoring credit portfolios are analyzed in a companion paper.

A Structural Analysis of the Default Swap Market, Part 2 (Relative Value), by Lisa Goldberg, Rajnish Kamat, and Jason Kremer

[Forthcoming in The Journal of Investment Management]

We evaluate several long/short strategies for managing a portfolio of default swaps. The strategies are based on a ranking of credits by residuals, which are the differences between market spreads and spreads generated by the iSpread structural model. Investment grade portfolios for the US and Europe earned an average of 70 basis points for each long dollar notional between January 2004 and December 2006. Non-investment grade portfolios earned 321 basis points averaged over the same regions and time period. Transaction cost estimates based on scenario analysis ranged from 19 to 27 basis points for investment grade and 26 to 54 basis points for non-investment grade portfolios. Strategies that aim to mitigate transaction cost by holding trades with little profit showed mixed results.

The Structure of Hybrid Factor Models, by Jose Menchero and Indrajit Mitra

[Published in The Journal of Investment Management, Vol. 6, No. 3 (2008), pp. 1-14]

Fundamental factor models are widely used in the asset management industry to forecast portfolio volatility. These models tacitly assume that the factors span all sources of systematic risk. If a significant factor has been omitted from the model, however, then portfolio risk estimates can be unreliable. One solution to this problem is to apply statistical factor analysis to the cross-sectional residuals in order to extract the omitted factor. This results in a so-called hybrid factor model, containing both fundamental as well as statistical factors. The relevant questions then become: (a) how can the statistical factor be interpreted within the context of the hybrid model, and (b) under what conditions can the omitted factor be successfully extracted? In this paper, we address both of these questions. We show that the statistical factor represents the omitted factor after being orthogonalized to the existing fundamental factors. We also derive analytic expressions for the correlations between the "true" factors and the estimated factors. These expressions allow us to derive the Miller criterion for successful extraction of statistical factors. Finally, we confirm our analytic results via numerical simulation.

The World is Not Enough? Expanding the Boundaries of International Equity Indices for International Investing¹

Arun A. Kumar

Abstract

Risk diversification combined with the pursuit of additional sources of return has been a major driver for institutional investors venturing into international markets. The MSCI Europe, Australasia and Far East (EAFE) Index has been a dominant benchmark for US-based institutional investors seeking international diversification. In this paper, using the MSCI EAFE Index as the international component, we first document how international investing has provided diversification benefits. We then introduce the additional segments – Emerging Markets and Small Caps – covered by the MSCI All Country World Investable Market Index (ACWI IMI) and discuss their risk-return profile and their role in furthering international diversification. We also describe the advantages of using MSCI ACWI IMI as the benchmark for strategic allocation and in performance benchmarking of mandates based on segments of it.

Introduction

International markets and investing continue to evolve – with international markets becoming more accessible and international institutional investors becoming interested in less traditional segments of the global investable universe. Institutional investors seeking diversification and additional sources of return have been venturing out of their domestic markets for many decades now. In some cases, where the local markets are relatively small, it is almost a necessity. However, there are benefits to international diversification even if the local market is large. In this paper, we trace the evolution of international investing, highlight the addition of new segments to indices reflecting the international investment opportunity set, and describe the potential uses of MSCI ACWI IMI, the most comprehensive index within the MSCI Global Investable Market Indices (GIMI).

The rest of the paper is organized as follows: In Section I, taking the perspective of a US-based institutional investor, we use the long history of the MSCI USA and MSCI EAFE Standard Indices² to illustrate the diversification offered by international investing and some of the factors that influence it. We also examine the performance of the MSCI World Index, which is a passive representation of Developed Markets equities. In Section II, we discuss diversifying into Emerging Markets (EM) and international small caps as the next step in the evolution of international investing. Using the MSCI Global Investable Market Indices, this section presents the risk-return tradeoffs and the enhanced opportunities for diversification that are now available from the comprehensive coverage of the various equity market segments. Section III highlights the potential uses of the most comprehensive index within the MSCI Global Investable Market Indices – the MSCI All Country World Investable Market Index (ACWI IMI) – as the strategic benchmark since it is a passive investable alternative whose components such as the MSCI EAFE Index, MSCI Emerging Markets Index (EM), and other indices can serve as performance benchmarks for active mandates without benchmark misfit³. Section IV concludes.

I. To Go Boldly Where No One Has Gone Before: For Diversification and Alpha

In many organizations, equity investing started as a domestic-only affair with institutional investors investing in securities and companies that they 'knew'. Given the domestic focus of many investors' goals and/or liabilities, investing in the local market was more natural.

¹ This article was first published on July 22, 2008. For the most recent MSCI constituent lists, please refer to the most recent product descriptions.

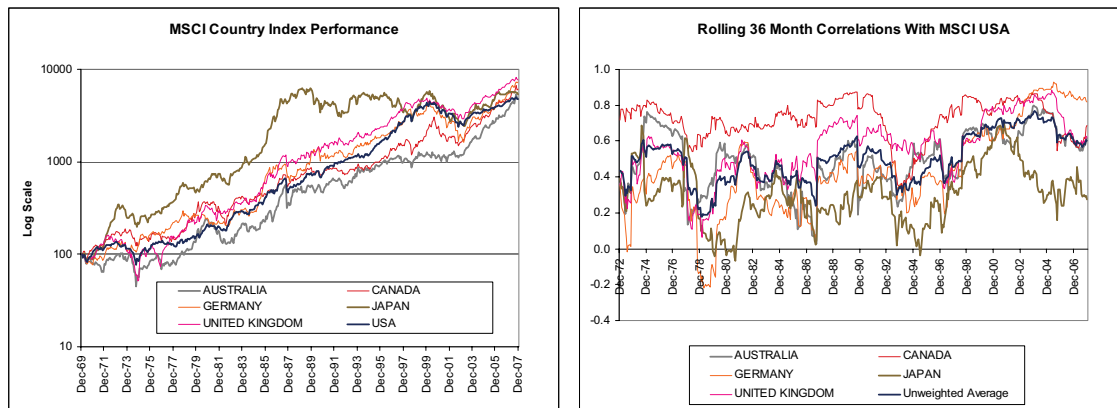
² Standard indices are the indices that have existed since 1969. They targeted 60% coverage of the full market capitalization of markets at inception in 1969, rising to 85% coverage of free float adjusted market capitalization in 2001. Under the MSCI Global Investable Market Indices Methodology, the Standard Indices refer to the combination of Large Cap and Mid Cap Indices still targeting 85% coverage.

³ Benchmark misfit arises when the aggregation of the mandates does not match the strategic portfolio allocation.

Additionally, investing outside the home country involved many obstacles in terms of lack of data, lack of infrastructure (trading, custody, delivery services as well as worries about the legal framework in foreign countries), and higher costs. The additional risk in terms of currency exposure was also an impediment.

Arrayed against all of these arguments was the benefit of diversification – the reduction in risk that comes about due to the lack of perfect correlation across assets – in this case, of securities dispersed geographically across countries, and the potential for higher return. The benefits of diversification appeared sufficiently attractive for institutional investors to nibble at investing overseas by allocating some of their portfolio to international equities. As can be seen in Figure 1, the major equity markets have not always performed similarly. The Japan bubble in the 1980s is clearly visible as is the non-participation of Australia in the tech bubble of the 1990s. Examining the rolling 36-month correlations of the US with the other markets, it is also clear that the correlations are not perfectly positive, suggesting that there is always diversification across countries, though it differs in magnitude over time⁴.

Figure 1: Equity Markets Behave Differently and Correlations with the US Rise and Fall

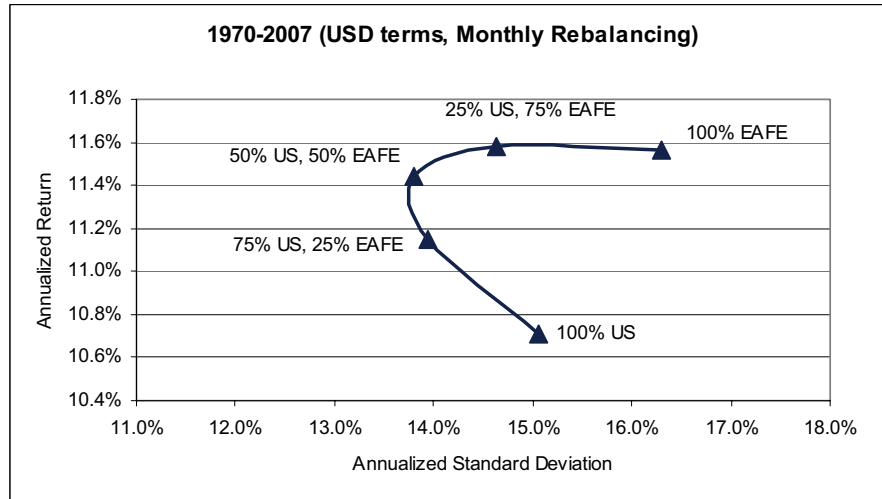


I.I The Domestic-International Approach: Baby Steps

The perceived benefits of diversification led to a ‘domestic-international’ approach to investing with international allocations being chosen as a small percentage of the overall portfolio. Originally, international investing involved investing in only the Developed Markets (DM) of the world and only in larger capitalization stocks. MSCI Barra created the MSCI EAFE Index to cater to this need by grouping all Developed Markets – except Canada – to serve as the international portion. The rationale for not including Canada was two-fold: many US allocations included Canadian companies; and related to it, as evidenced by the correlation chart in Figure 1, the correlation of Canada with the US was very high. Further, some US equity indices included Canadian companies as well.

⁴ The charts in this section use the Standard indices.

Figure 2: Going Abroad Has Provided Diversification



Going international was beneficial on a risk-reward basis. Figure 2 shows the efficient frontier that is described by the combination of the MSCI USA Index with the MSCI EAFE Index. This data covers the period from 1970 to 2007 and uses ex-post total returns in USD. The efficient frontier shows that even a moderate MSCI EAFE Index exposure was generally beneficial to the US investor during this period in terms of lowering risk and/or increasing return⁵.

I.II To Hedge? Or Not to Hedge?

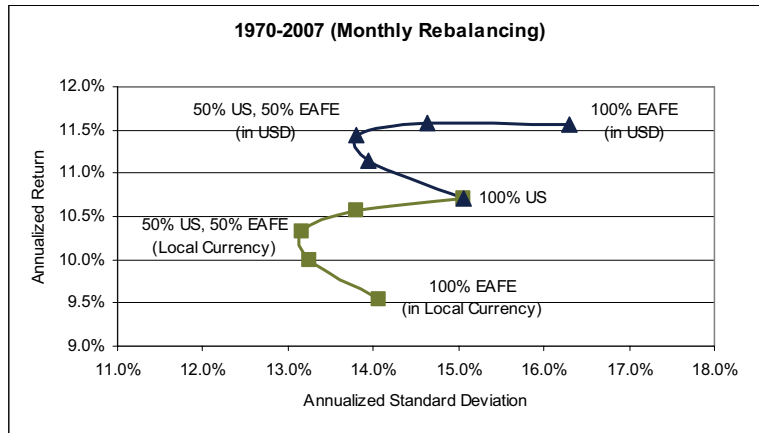
The story, however, has more layers to it than a simple “Invest Abroad” rallying cry. The proportion of the allocation directed internationally and the decision to hedge or not hedge currency risk have helped and hindered performance and risk over the last several decades in some significant ways.

Figure 3 shows the impact on the efficient frontier from hedging the international exposure. Here we use the local currency returns in calculating the risk and return to represent hedged returns⁶. From a US investor’s perspective, hedging international allocations lowered the return from the international allocation over the entire period. However, the diversification argument remained valid – risk was lowered with an allocation to EAFE compared with a US-only portfolio.

⁵ The combinations shown in this and other charts depicting the efficient frontier use incremental allocations of 25% between the extremes. This analysis is based on monthly rebalancing to the chosen proportions.

⁶ Local currency returns aggregate returns from different markets in their local currencies and can be considered the perfectly hedged returns.

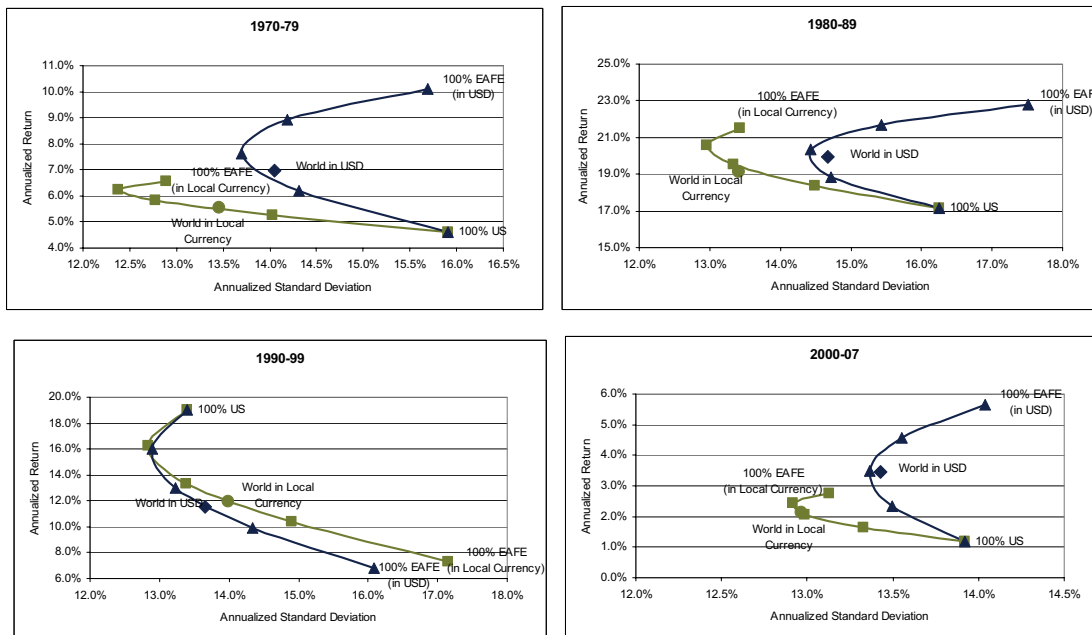
Figure 3: From a US Perspective, Not Hedging the Currency Exposure has Produced Higher Risk, But Also Higher Return



I.III A Look at Sub-periods

A relevant question in the context of international investing is how consistent this benefit from international investing has been over time. The four charts in Figure 4 portray the (ex-post) efficient frontier described by the US-EAFE allocation for the 70s, 80s, 90s, and 2000-07. Examining the efficient frontier depiction at different time intervals, it appears that the optimal international allocation and the impact of hedging currency exposure have varied with time.

Figure 4: International Allocations Lowered Portfolio Volatility in All Decades



Note: Local currency returns aggregate returns from the different markets in their respective currencies. It is equivalent to having a perfectly hedged index.

The efficient frontier in each chart of Figure 4 uses the same fixed allocations as before to international equities with monthly rebalancing. While the optimal allocation between US and international equities, ex-post, has varied over time, allocating a portion of the portfolio outside of the US has always led to lower volatility during each of the four sub-periods studied. In addition, in the 70s, 80s, and 2000s, local currency investing (i.e. hedged) produced lower standard deviation than unhedged USD investing. USD-based investing produced better returns, driven by the weakening of the USD. The 1990s however provided a different experience: domestic investing in the US produced better returns than investing in EAFE and the lowest volatility was achieved with a smaller allocation to the MSCI EAFE Index than in the other sub-periods studied.

In sum, international diversification worked the way it is supposed to – investing a portion of the portfolio outside the US produced lower risk in every sub-period studied since 1970. Currency hedging helped to lower volatility further – but produced lower returns except during the 90s, while the MSCI EAFE Index produced better returns than MSCI USA in every sub-period except the 90s.

I.IV The MSCI World Index: A No Home-Bias Solution

International diversification requires one to choose the proportion to be invested internationally and how frequently to rebalance⁷. They are active decisions relative to a market benchmark. A common benchmark in this context of investing in Developed Markets is the MSCI World Index that includes all DM countries comprising EAFE, USA, and Canada. The risk and return of the MSCI World Index is also depicted in each chart of Figure 4 and shows how a “passive” allocation to international investing would have performed. The MSCI World Index reflects a passive allocation because it represents the opportunity set and the weights of the US and the World-ex US portions are determined largely by market movements⁸.

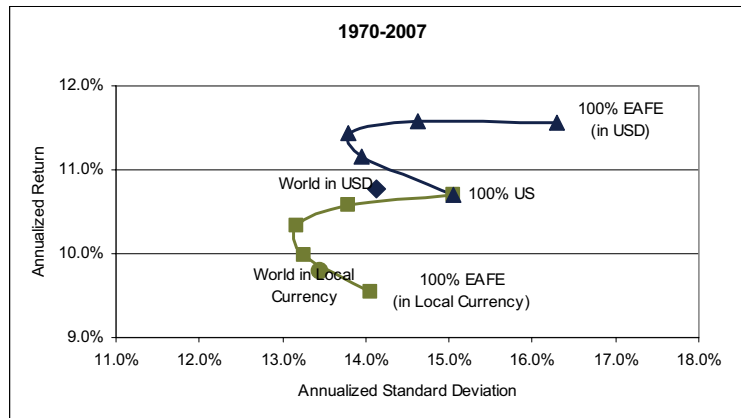
The MSCI World Index risk-return, as shown in Figure 4, is close to the ex-post efficient frontier in each sub-period studied. The selected fixed allocations and the monthly rebalancing decision, used to derive the efficient frontier, by contrast, could be considered as active decisions since they involve a choice other than that passive strategy. In Figure 5, which covers the entire period and is the same as Figure 3, but with the MSCI World Index added, the MSCI World Index in USD terms lies outside and below the monthly-rebalanced efficient frontier. This suggests that rebalancing to a fixed allocation may have helped with risk and return for the overall period especially in USD terms⁹. The risk and return for the overall period also seems to be influenced by the 90s experience, which is the decade that saw the MSCI EAFE Index produce lower returns than the MSCI USA Index.

⁷ To hedge or not is another decision.

⁸ The turnover in the index usually occurs due to rebalancings required to reflect the evolution of the financial markets in terms of new companies and other events. There have been enhancements to the methodology such as the transition to free-float weighting and increasing coverage to 85% from 60% that also resulted in turnover.

⁹ Rebalancing to a fixed allocation involves selling the winners (the allocation that has increased beyond the fixed allocation) and buying the losers (the allocation that has fallen below the fixed allocation) which would perform better in a reversion-to-mean environment.

Figure 5: The MSCI World Index Versus Fixed Allocations



The MSCI World Index is a benchmark that can be used to represent a passive global allocation and can be considered a neutral allocation. Furthermore, any other domestic-international allocation would suggest a home bias (or not) and is an active deviation from this neutral allocation¹⁰. The value of such a deviation in the strategic allocation, including the domestic-international allocation can be evaluated against the neutral allocation provided by the MSCI World Index. Furthermore, tactical allocation changes and rebalancing decisions, which can be costly, can be evaluated against the passive buy-and-hold MSCI World Index.

Using the MSCI World Index also eliminates the need to mix and match multiple methodologies from different providers for the domestic and international pieces. Different index providers use different methodologies to define their country indices. Domestic indices tend to use a number of companies approach that can, over time, cover significantly different proportions of the market. Across countries, the coverage may result in structural over or under representations of certain markets. A percentile approach can overcome this issue – but the methodologies, including maintenance methodologies, may be different across index providers and be difficult to manage operationally. The underlying country and regional indices of the MSCI World Index can facilitate the awarding of mandates to specialist managers and serve as appropriate performance benchmarks for those managers, while the use of a consistent methodology across the globe helps avoid any benchmark misfit when aggregated up to the overall portfolio level.

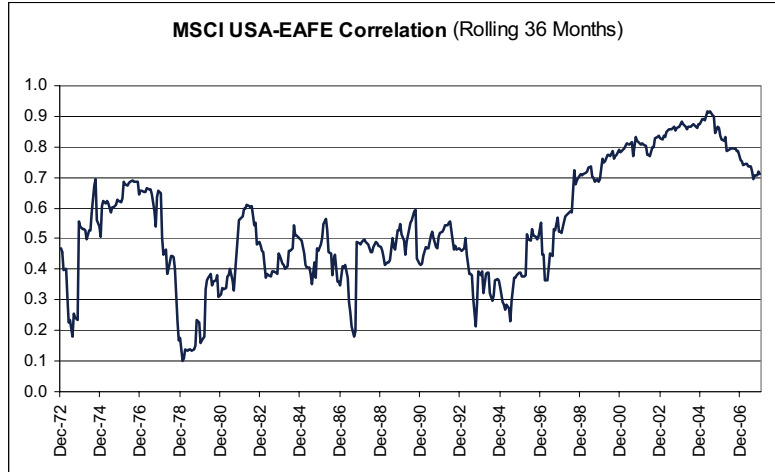
II. As the World Turns: The Opportunity Set Needs To – and Does – Grow

Things change. Looking at the correlation between the MSCI USA and MSCI EAFE Index in Figure 6, the significant benefits of diversification from 1972 to the mid-90s are clearly visible. The average 36-month rolling correlation was 45% during this period. However, since then, the correlation has increased to 78%. With correlation being less than 100%, international diversification is still alive. However, the increase in domestic-international large cap correlations led institutional investors to seek additional sources of diversification (as well as return) in more than just the Developed Markets represented by the MSCI World Index¹¹. In other words, some investors felt the world is not enough.

¹⁰ Any allocation to domestic equities by a US investor that is larger than the US portion of the global index, by definition, shows a home bias.

¹¹ Schoenfeld and Jaron (2007) also argue that EAFE does not fully capture the international opportunity set.

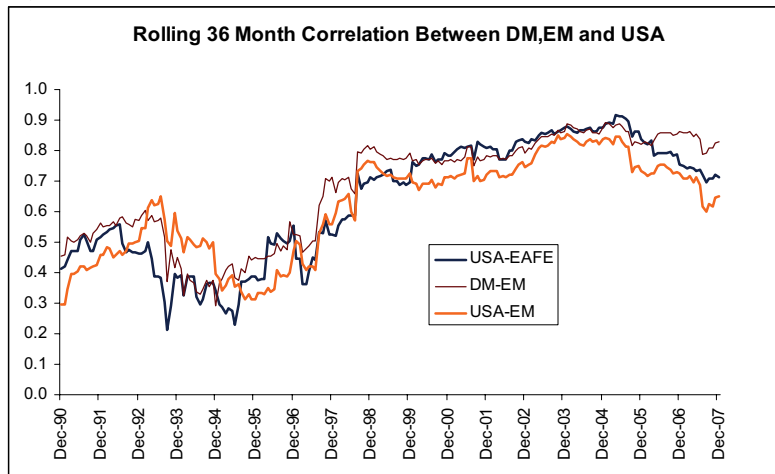
Figure 6: The US-EAFE Correlation Has Risen In the Last Decade



Concurrently, as international markets opened up and international investing and liquidity grew, more of the world market cap became investable. Many of the initial roadblocks to international investing have also become less problematic. Information flow has increased and accounting has become more consistent with the establishment and convergence of standards set by the FASB and IASB. Trading costs also continue to decline.

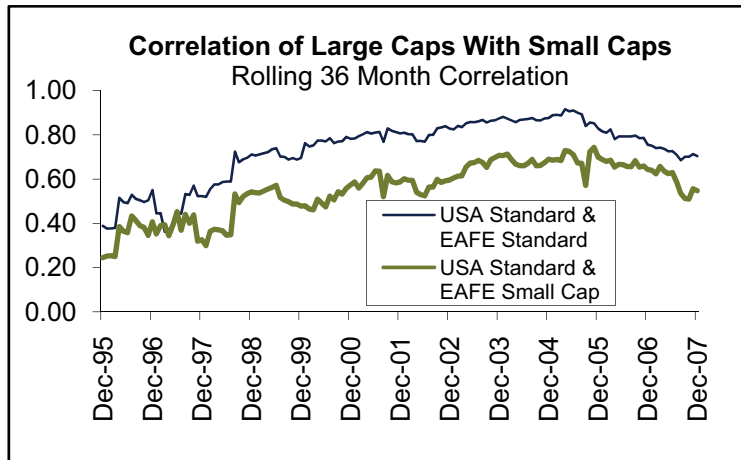
To respond to institutional investor desire for additional sources of diversification, MSCI Barra launched the MSCI Emerging Markets Indices in 1988. Emerging Markets are perceived to possess higher potential for growth, albeit with higher risk, and to be less correlated with Developed Markets. As Figure 7 shows, the correlations between Developed Markets and Emerging Markets and between the US and Emerging Markets were low until the mid 90s. Both correlations then increased but have become lower recently.

Figure 7: EM-DM Correlations Have Increased



In their quest for further diversification, institutional investors also turned to international small caps to augment their small cap exposure domestically and to increase their coverage of the opportunity set beyond the MSCI Standard Indices which cover mostly large and mid cap stocks. As shown in Figure 8, international small caps have had less correlation with US domestic markets than international large and mid caps as represented by the MSCI EAFE Index and have thus provided an additional source of diversification.

Figure 8: Large Cap – Small Cap Correlations Are Still Low

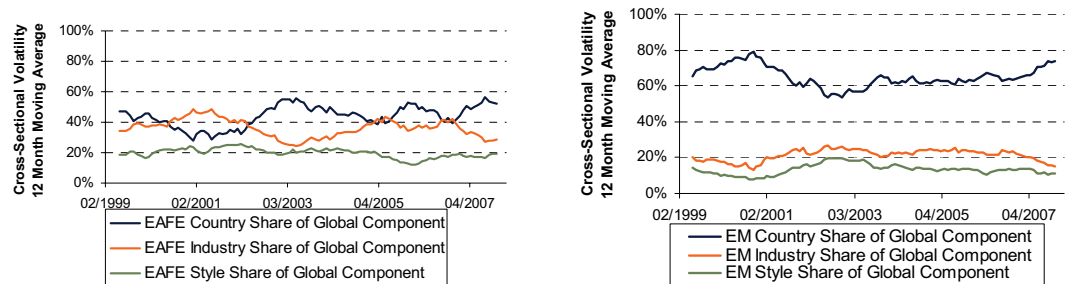


II.I Not More of the Same: New Segments Possess Different Characteristics

However, Emerging Markets and international small caps do behave differently compared to Developed Markets large cap stocks. One way to demonstrate this is through the use of factor models. A factor model allows one to decompose the returns of a set of assets, and therefore the cross-sectional volatility, into various components. By looking at the percentage of cross-sectional volatility that can be attributed to the various sources of return, we can gain a better understanding of the sources of risk (and opportunities for return) in the major equity markets.

In Figure 9, the global component of returns is broken down into country, industry, and style factors for the MSCI EAFE and MSCI EM Indices. As the charts show, while industry selection sometimes matters as much as country selection in explaining returns in Developed Markets, country selection plays a much more significant and consistent role in explaining returns in Emerging Markets¹².

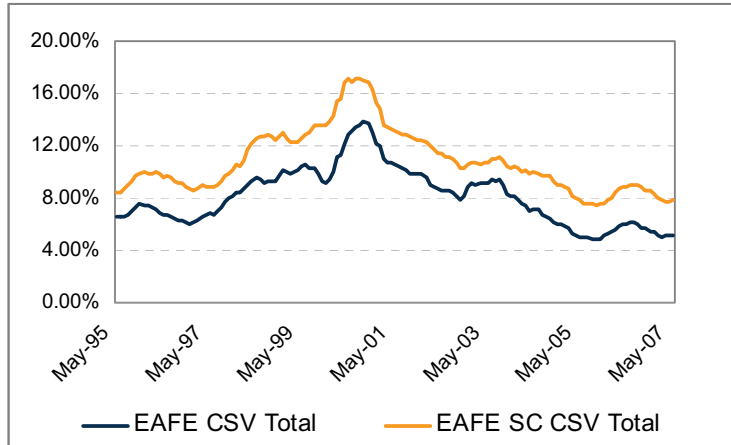
Figure 9: The Country Factor Drives Risk and Return More in EM than EAFE



In terms of small caps, the cross sectional volatility of returns has been significantly higher than that of large caps. The higher cross sectional volatility reflects the higher risk of small caps but also greater potential opportunities for return for institutional investors who can identify them¹³. However, passive products based on well-constructed small cap indices may also be an option for small cap investing.

¹² See "Cross Sectional Volatility for Global Equities" in the MSCI Barra Global Capital Markets Yearbook 2007.
¹³ See Frank Nielsen, "International Small Caps: A Distinct Asset Class?" Journal of Indexes, Nov/Dec 2007.

Figure 10: Small Caps Exhibit More Cross Sectional Volatility than Large Caps



II.II MSCI ACWI IMI Reflects the Expanded Opportunity Set

The MSCI World Index is a consistently constructed index reflecting the Developed Markets large and mid cap opportunity set. The MSCI Emerging Markets and MSCI Small Cap Indices complement it by adding those segments to the investment basket. The MSCI Global Investable Market Indices combine the MSCI Standard Indices and the MSCI Small Cap Indices for both the Developed and Emerging Markets, using a methodology that balances size integrity and market coverage to create a consistent family of indices that provides geographic and size segmentation. The most comprehensive index within the MSCI Global Investable Market Indices (GIMI) is the MSCI ACWI IMI, which comprises more than 8000 securities and represents about USD 33 trillion in market capitalization.

From a US investor perspective, Figures 11 and 12 show that the US, including small caps, is only 42.2% of the global investable opportunity set. Adding the MSCI EAFE Index (the Standard Index) to the equity allocation provides another 37.5% coverage – but still leaves out Emerging Markets (11.5%), EAFE Small Cap (4.4%), and Canada, which has grown to become 4.4%.

Figure 11: Putting it All Together: GIMI - The World on a Platter

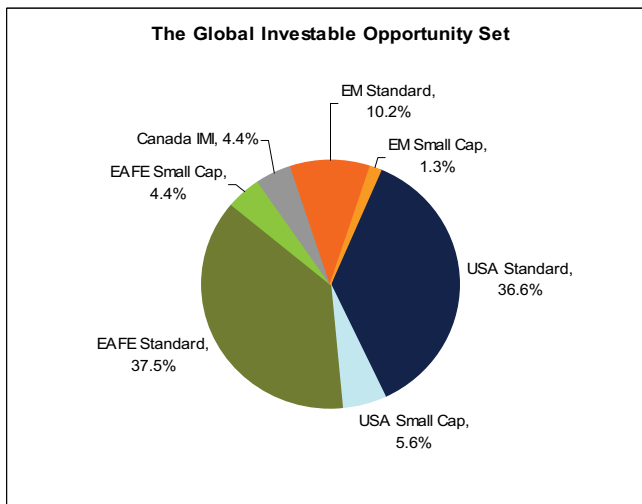


Figure 12: GIMI – Comprehensive Coverage

	Number of Countries	Weights in ACWI IMI			Number of securities		
		Standard Index	Small Cap Index	Investable Market Index	Standard Index	Small cap Index	Investable Market Index
ACWI	48	88.1%	11.9%	100.0%	2,529	6,118	8,647
WORLD	23	78.0%	10.6%	88.5%	1,744	4,460	6,204
EAFE	21	37.5%	4.4%	41.9%	1,023	2,369	3,392
DM NORTH AMERICA	2	40.5%	6.2%	46.6%	721	2,091	2,812
USA	1	36.6%	5.6%	42.2%	623	1,878	2,501
DM EUROPE	16	25.6%	2.7%	28.4%	513	1,171	1,684
DM PACIFIC	5	11.9%	1.7%	13.6%	510	1,198	1,708
EM	25	10.2%	1.3%	11.5%	785	1,658	2,443
EM ASIA	9	5.0%	0.8%	5.8%	480	1,210	1,690
EM EMEA	10	2.6%	0.2%	2.9%	173	298	471
EM LATIN AMERICA	6	2.6%	0.2%	2.8%	132	150	282

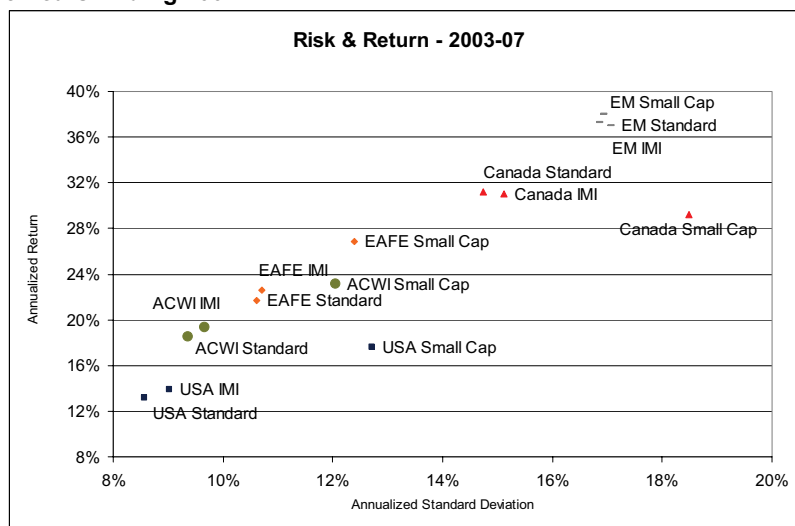
Data as of June 30, 2008.

This table does not include the MSCI Frontier Market Indices, which cover another 19 markets, and the MSCI Saudi Arabia, MSCI Lithuania and MSCI Serbia Indices which are included in the Frontier Markets country coverage but which are not currently part of the MSCI Frontier Markets Index.

II.III The Addition of Asset Segments Enhances the Opportunity Set

The risk and return produced by the different segments of the global investable markets are depicted in Figure 13. It is clear from the chart that Emerging Markets have provided higher returns than Developed Markets and small caps have generally produced better returns than the larger cap MSCI Standard Indices during this period. The risk of these segments, by themselves, is also higher, confirming the traditional finance principle of higher return being associated with higher risk. However, the cost and benefit of these segments should also be considered in the context of a portfolio rather than in isolation, given the diversification benefits offered by these segments.

Figure 13: The Risk and Return Trade-off by Geography and Size in the 5 Years Ending 2007

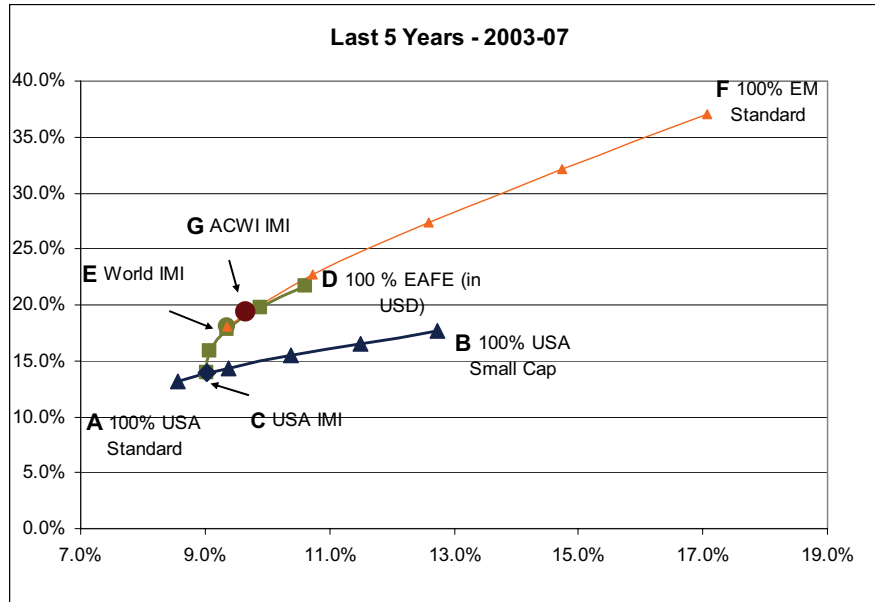


In USD terms.

The benefit of adding domestic small caps and international DM and EM allocations including small caps, to a domestic-only large cap portfolio can be seen by the impact it has in terms of changing the risk-return frontier as shown in Figure 14. Starting with a 100% US large and mid cap allocation (depicted by the 100% MSCI USA Standard Index

point, A), the addition of small caps within the US, denoted by segment A-B, raises both return and risk as the efficient frontier moves toward the upper right hand side of the chart. The MSCI USA IMI, denoted C, is an alternative that provides comprehensive passive coverage of the US market.

Figure 14: The MSCI ACWI IMI Provides a Passive Alternative that is Close to the (ex-post) Efficient Frontier



In USD terms

Adding the MSCI EAFE Index to the MSCI US IMI provides further diversification as the efficient frontier described by segment C-D has the familiar bullet-shape. The MSCI World IMI (Developed Markets), denoted by point E, can then be used as a passive allocation alternative to global Developed Markets equities without having to choose geography or size within that opportunity set.

Adding MSCI EM Standard to MSCI DM IMI, depicted by segment E-F, extends the efficient frontier to the right and above as, during this time period, Emerging Markets have produced higher returns, albeit alongside higher risk. The MSCI ACWI IMI, point G, depicts the risk-return tradeoff achieved by including both Developed and Emerging Markets, including the small caps. MSCI ACWI IMI is a passive representation of this investment opportunity set requiring no inputs in terms of selection or allocations and is an investable and replicable index.

III. Potential Uses of MSCI ACWI IMI

The MSCI World Index depicted the investable opportunity set in earlier times. With the increased accessibility and interest in EM and international small cap, the investable opportunity set has expanded. The addition of EM makes the MSCI ACWI the passive representation of the large and mid cap opportunity set. With small caps from DM and EM also included, the MSCI ACWI IMI is now a comprehensive passive depiction of the opportunity set including its size and structure.

The MSCI Global Investable Market Indices are built with a consistent methodology that recognizes individual market differences around the world through the use of an approach that balances size integrity with market coverage. This allows for the world's markets to be represented in a consistent manner in a single index comprehensively and without any structural biases in size segments or country representation. Investors do not need to mix and match indices built with different approaches (such as number of securities, percentile coverage) or different methodologies (such as different liquidity requirements, rebalancing

schedules) which may result in significant gaps or overlaps in coverage and also be operationally problematic.

Being investable and replicable, MSCI ACWI IMI is perhaps a natural choice as the strategic allocation benchmark. Any deviation from the natural weights in the benchmark becomes an active allocation and can be evaluated against the benchmark to measure the value added by that decision. The different components of MSCI ACWI IMI also allow asset owners to research and understand the risk and return of these segments at granular – country, size, style, sector – or aggregate levels.

The segmentation of the global investable markets by region and now by size segment, lends itself to specialization by portfolio managers. Concurrently it offers asset owners the ability to award mandates to portfolio managers based on their specialization. The performance of the specialist managers can then be evaluated against the appropriate segment. Asset owners can also decide which segments to award as active mandates and which ones to manage passively, thus helping with the alpha-beta separation and paying performance fees only for alpha. At the same time, the aggregation of all of these pieces of the puzzle adds up to the strategic benchmark, MSCI ACWI IMI, without any gaps or overlaps – i.e. without any benchmark misfit.

IV. Conclusion

International investing has been beneficial in providing risk diversification and additional sources of return. The evolution of international investing has required constant revisions to the investment universe and hence updates to the indices that represent that opportunity set. The MSCI Global Investable Market Indices provide comprehensive coverage along with a consistent approach that takes into consideration the differential distributions of market capitalizations and the differences in the nature of Developed and Emerging Markets

MSCI ACWI IMI, the most comprehensive of the MSCI Global Investable Market Indices, provides geographical and size based diversification in one single investable index. It can readily serve as the strategic allocation and the benchmark for the overall passive global portfolio. The component indices can be used to award mandates to specialist managers and serve as appropriate performance benchmarks. It is also convenient, since no adjustments need to be made to reconcile different methodologies, and the separate segment benchmarks can be rolled up into the overall portfolio without any benchmark misfit.

These latest developments usher in the next stage in the evolution of equity investing where the domestic-international approach or the DM-only or DM-EM approach or the large cap only approach appear less complete. However, the world keeps turning and international investing keeps evolving. The next frontier appears to be the aptly named Frontier Markets. MSCI Barra has already created equity indices for 22 Frontier Markets, 19 of which form the MSCI Frontier Markets Index. While currently considered more specialized, only time will tell if and when these Frontier Markets will become more integrated into the international investment opportunity set.

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Do Risk Factors Eat Alphas?

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Dan Stefek

Abstract

Although widespread, the practice in portfolio optimization of using different factor models for risk and alpha has potential pitfalls. Discrepancies between risk and alpha factors can create unintended exposures in optimized portfolios that may hamper performance. An analysis reveals the root of the problem. The optimizer emphasizes the portion of the manager's alpha that is not captured by the risk factors. Aligning the risk and alpha models may lead to better portfolios, even if doing so worsens the overall risk forecasts. In this article, four ways of remedying these problems are presented and compared using familiar optimization problems.

Introduction

Portfolio managers often use factor models to forecast risk and exceptional return or "alpha." Many use risk models based on one set of factors and alpha models based on another, overlapping set of factors. Risk factors are selected to explain portfolio volatility while alpha factors are chosen to forecast out-performance.

Portfolio optimization requires forecasts of both risk and alpha. The practice of using different models for risk and return in portfolio optimization, though widespread, has raised some concern. Portfolio managers worry that discrepancies between risk and alpha factors may create unintended biases in their optimized portfolios. This has led some to wonder whether it is better to use a risk model that is more aligned with their alpha factors.

Little research has been published on this topic. Some researchers and practitioners have asserted that it is important to include the alpha factors in the risk model used in optimization. However, not much has been written on the consequences of ignoring that prescription.

We analyze the ramifications of using different factor models of risk and alpha in portfolio optimization. Our results show that:

- Using different models for risk and alpha can lead to unwanted portfolio exposures and may hinder performance
- Aligning risk factors with alpha factors may improve the information ratio of optimized portfolios, even if doing so lowers the overall accuracy of risk forecasts
- There are ways of modifying a risk model that may help remedy the problems described above

We begin by briefly reviewing risk and alpha models. Next, we demonstrate how differences between alpha and risk factors may lead to inadvertent bets in optimized portfolios and we rigorously analyze the root of the problem. Then using a simple model, we show how employing a consistent set of alpha and risk factors may improve the quality of the solution. Finally, we describe four approaches to surmounting these difficulties and we explore their effectiveness on familiar optimization problems.

I. Risk and Alpha Models

Often a distinction is made between factor models used to forecast risk and those used to forecast return or alpha. In theory, these models are fundamentally similar. Both are predicated on the belief that security returns are driven by pervasive influences in the market and that these factors account for both return and risk. There is no reason, in principle, that one could not have one factor model that accounts for both risk and alpha.

In practice, portfolio managers often use different models for risk and alpha. Risk models typically include a comprehensive set of broad factors – e.g. styles and industries - that explain the volatility and the cross-sectional dispersion of security returns. Alpha models

decompose return into benchmark and exceptional return. They often use broad factors to account for the benchmark return together with another set of factors – e.g. momentum, earning quality, sentiment – designed to capture exceptional return.

Naturally, there may be significant overlap between risk and alpha factors. For example, the Barra US Equity Risk Model includes factors for momentum, earnings yield, value and growth which also are components of many managers’ alphas. It is important to note, however, that the precise definitions and measures of these factors may differ materially between alpha and risk models.

Both risk and alpha models attribute return as follows:

$$r = X_R f_R + u_R \tag{1}$$

$$r = X_A f_A + u_A \tag{2}$$

where r is a vector of excess returns, X_R (X_A) is a matrix representing the asset exposures to the risk (alpha) factors, f_R (f_A) are the returns to the risk (alpha) factors and u_R (u_A) are the idiosyncratic or specific returns not explained by the factors.

Portfolio optimization requires an asset covariance matrix and a set of alphas. From equation (1) we can write the covariance matrix as:

$$\Sigma_R = X_R F_R X_R' + \Delta_R \tag{3}$$

where F_R is the covariance of the risk factors and Δ_R is the (diagonal) covariance matrix of the specific returns.

As is customary, the alphas are formed as a weighted combination of the alpha factor exposures:

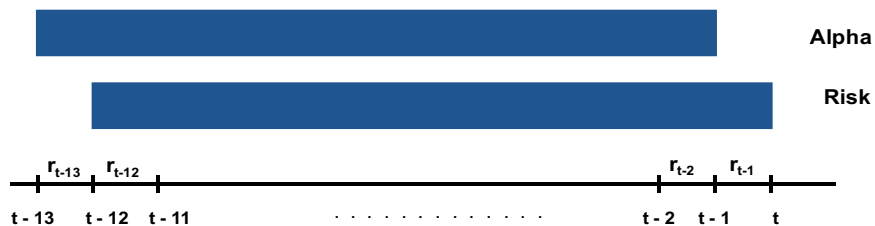
$$\alpha = X_A w. \tag{4}$$

II. What Could Go Wrong?

We now illustrate a problem that can arise when a manager uses different models of risk and alpha.

Consider the case of a portfolio manager who bets on twelve month price momentum defined as the sum of the last twelve months’ returns lagged one month from the date of usage. More precisely, the manager’s alpha at the beginning of month t is:

$\alpha_t = r_{t-2} + r_{t-3} + \dots + r_{t-13}$, where r_t is the return over month t . The risk model has a momentum factor that differs slightly from the alpha. Exposure to momentum is defined simply as the sum of last twelve months returns - without a lag. This is depicted below.



What happens when the manager optimizes the portfolio? To answer this, we perform an active, unconstrained optimization with the Barra US Equity Risk Model, modifying its momentum factor to match the description above. The S&P 500 serves as both the investment universe and the benchmark.

Panel A of Figure 1 shows the optimal portfolio's active exposures to the risk model factors. It also shows the active exposure to one month momentum which we define as the return over the previous month, r_{t-1} , and to one-month momentum lagged by twelve months, i.e. r_{t-13} . These measures reflect how well stocks did last month and thirteen months ago. The alpha and all exposures are normalized – i.e. have a mean of zero and a standard deviation of one – across the US Equity model's estimation universe.

Figure 1A: Active Exposure

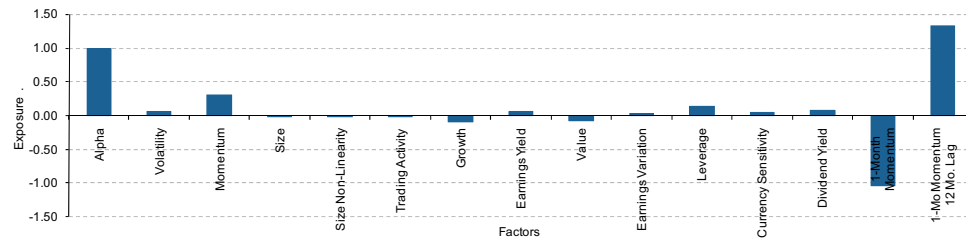
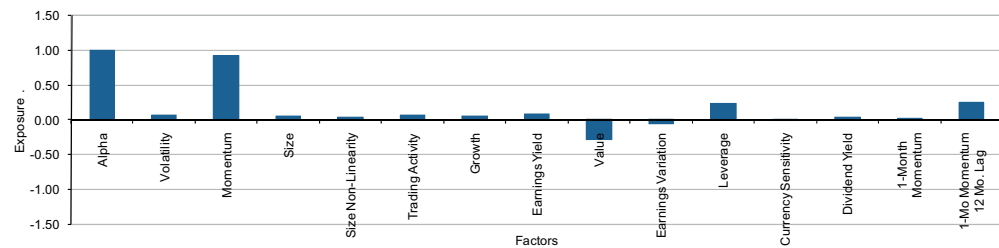


Figure 1B: Active Exposure after Replacing the Momentum Exposure



We see that optimal solution takes a unit bet on the alpha¹⁴. Surprisingly, the portfolio's exposure to the risk model's momentum – which differs in composition by only two months – is just 30% of that. Even more surprising is that the portfolio takes a very large bet against stocks that outperformed the previous month and a very large bet on stocks that outperformed thirteen months ago. Chances are this is not what the portfolio manager has in mind.

Why does this happen? At the root of the problem is the difference in the way the alpha and risk models define momentum. The alpha model includes the return from thirteen months ago but the risk model does not. Thus, the optimizer sees return but no factor risk in month thirteen exposure and loads up. On the other hand, the risk model includes the return from one month ago but the alpha model does not. In this case, the optimizer sees risk but no return and underweights one month momentum¹⁵.

When the risk and alpha models agree on the definition of momentum this problem disappears. This may be seen in Panel B, which shows the results of the same optimization using a risk model whose momentum matches the alpha. To achieve this consistency, we simply make the momentum exposures in the risk model match the alphas, leaving the rest of the model alone.

¹⁴ For those curious, we scaled the risk aversion to achieve this.

¹⁵ The optimizer underweights one month momentum rather than remain neutral in order to offset the risk of the overall bet on momentum.

III. A Closer Look

In the example above, the optimizer exploited an inconsistency between risk and alpha factors, resulting in inadvertent and unwanted bets. In this section, we provide a more general analysis of this problem.

To understand the interplay between risk and alpha factors in optimization, it is useful to decompose the manager's alpha into a part that is spanned by the risk exposures, α_R , and a part that is orthogonal to them, α_{R_\perp} . We can accomplish this by regressing the alphas against the risk exposures. The spanned alpha is the fit from the regression and the orthogonal alpha is the residual. This can be written as:

$$\alpha = \underbrace{X_R(X_R'X_R)^{-1}X_R'\alpha}_{\alpha_R} + \underbrace{\left(I - X_R(X_R'X_R)^{-1}X_R'\right)\alpha}_{\alpha_{R_\perp}} \quad (5)$$

A key point is that these components of alpha are viewed differently by the risk model. The spanned alpha is captured by the risk factors. A tilt in its direction incurs factor risk. In contrast, the orthogonal alpha is outside the risk factors since $X_R'\alpha_{R_\perp} = 0$. Tilting the portfolio in this direction incurs no factor risk.

Now, suppose a manager solves the unconstrained, active optimization problem:

$$\text{Maximize } \alpha'h - \frac{\lambda}{2}h'\Sigma h \quad (6)$$

where h is the vector of active weights and λ is the risk aversion parameter.

The optimal portfolio is: $h^* = \frac{1}{\lambda}\Sigma^{-1}\alpha$. We can rewrite this to highlight the role of the risk factors:

$$h^* = \frac{1}{\lambda\sigma_s^2} \cdot \alpha_{R_\perp} + \frac{1}{\lambda\sigma_s^2} \cdot \left(I - X_R(X_R'X_R + \sigma_s^2 F_R^{-1})^{-1} X_R' \right) \alpha_R \quad (7)$$

For simplicity, we assume that the risk model forecasts the same specific risk for all assets, σ_s .

The optimal solution is the sum of two terms. The first term is simply the orthogonal alpha, scaled to adjust for specific risk. The second term is the contribution of the alpha spanned by the risk exposures. This component of alpha is not represented as directly in the optimal solution. It is both scaled for specific risk and adjusted – twisted and shrunk – to mitigate the common factor risk that it bears. In a sense, the optimizer favors α_{R_\perp} over α_R !

To see this more clearly, assume there is only a single factor in the risk model, with volatility σ_{f_R} . If we optimize over a universe with n assets, the solution is¹⁶:

$$h^* = \frac{1}{\lambda\sigma_s^2} \cdot \alpha_{R_\perp} + \frac{1}{\lambda\sigma_s^2} \left(\frac{\sigma_s^2}{n\sigma_{f_R}^2 + \sigma_s^2} \right) \cdot \alpha_R \quad (8)$$

¹⁶Here, we assume that the risk exposures and alpha exposures are normalized.

The optimal portfolio is simply a weighted sum of $\alpha_{R\perp}$ and α_R . We see that $\alpha_{R\perp}$ always has a greater weight than α_R . Furthermore, α_R 's relative weight shrinks even more as the factor volatility increases and number of assets increases.

By accentuating the component of alpha that is not captured in the risk model, an optimizer may produce unwanted portfolio exposures. Returning to our example of the momentum manager, much of the manager's alpha - exposure to lagged momentum - is captured by the risk model. So, α_R resembles α . On the other hand, $\alpha_{R\perp}$ reflects the difference between momentum as measured by the alpha and risk models. It is heavily weighted against one month momentum and toward out-performance that occurred thirteen months ago. Since the optimizer favors $\alpha_{R\perp}$, the optimized portfolio takes these same concentrated bets.

IV. Unexpected, Yes – But is this Bad for You?

In this section, we investigate how using different models of risk and alpha affects the quality of an optimized portfolio. The problem is complex and our goal is insight. To that end, we analyze a simple case where all asset returns are generated by a single factor. Here, the risk and alpha models are based on same factor but measure it differently. In this context, alpha is just the expected return of the asset and the benchmark is cash.

Specifically, we assume that returns to a universe of n assets are driven by a single factor, f , as follows:

$$r = Xf + u \quad (9)$$

where $u \sim N(0, \sigma_s^2 I_n)$. The true asset covariance matrix is given by:

$$\Sigma = \sigma_f^2 XX' + I_n \sigma_s^2 \quad (10)$$

where σ_f is the factor volatility and σ_s is the specific volatility which we assume is the same for all assets. All exposures are normalized.

We further assume that the manager uses separate single factor models to capture risk and alpha. These models are imperfect, however. In particular, they estimate the exposures of the assets to the factors with error. Our measure of the accuracy of each model is the correlation between the model's exposures and the true exposures. We denote these ρ_A and ρ_R for the alpha and risk models, respectively.

Thus:

$$X_A = \rho_A X + \varepsilon_A \quad (11)$$

$$X_R = \rho_R X + \varepsilon_R \quad (12)$$

where the errors are distributed normally, $\varepsilon_A \sim N(0, (1 - \rho_A^2) I_n)$ and $\varepsilon_R \sim N(0, (1 - \rho_R^2) I_n)$, and they are uncorrelated to X , r and to each other.

For simplicity, we ignore any estimation error in computing the factor returns, f_R, f_A , used for the alpha and the factor covariance matrix. Effectively, our calculations assume that the models are estimated over a very large universe and a long time.

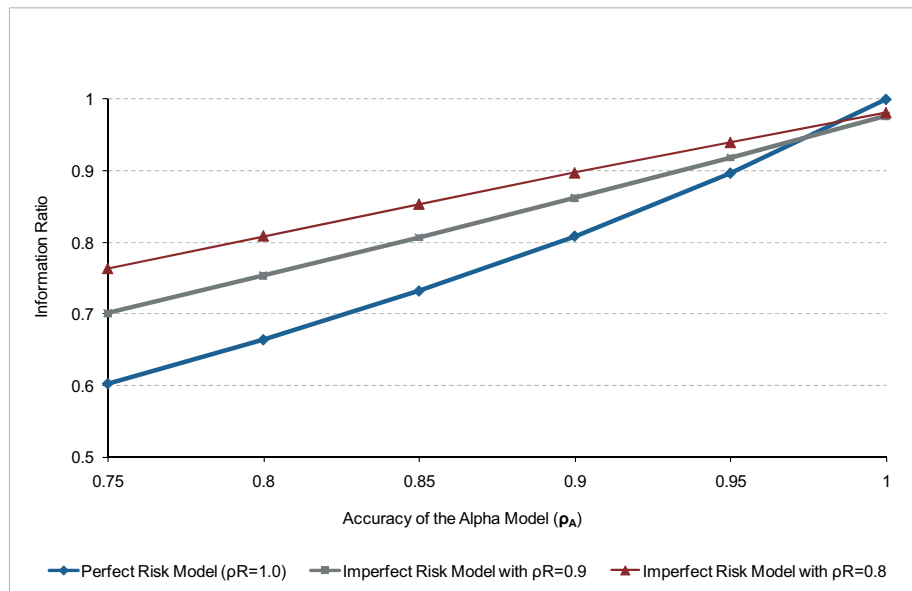
The errors in exposures produce misestimates of alpha and risk. The true alphas (i.e. expected returns) are $X'E(f)$. The manager's alphas are noisy estimates of these: $\alpha = X_A E(f_A)$. Similarly, the risk model's forecasts of factor risk will be imperfect, in general. However, we assume that the risk model uses the true specific covariance matrix, so its forecasts of specific risk are accurate.

Now, let's see what happens when a manager optimizes a portfolio using different risk and alpha models. We use three risk models with different accuracies: $\rho_R = 1$ (perfect model), .9 and .8. With each, we perform a series of unconstrained optimizations with alphas of varying accuracies over our universe of stocks. To assess performance, we calculate the ex-ante information ratios of the resulting portfolios using the true model¹⁷. In our examples, we set the maximum IR possible to one to facilitate comparisons.

Figure 2 shows the results for optimizations with 500 stocks. The true factor and specific annual volatilities are 1.5% and 30% respectively.

As expected, the IR declines as the accuracy of the alpha decreases. What is striking, however, is that it is not always better to use a perfect risk model! Less accurate models work better when the alpha is sufficiently imperfect. Stranger yet, it is better to use an 80% accurate risk model than a 90% accurate risk model. What is going on?

Figure 2: Impact of the Risk Model on Performance



¹⁷ The optimizations and calculations of returns and risks were done analytically, assuming that $X'\varepsilon_A$, $X'\varepsilon_R$ and $\varepsilon_R'\varepsilon_A = 0$.

To understand why this happens, we first decompose the manager's alpha into the part spanned by the risk exposures and the part orthogonal to them. In this case, we have:

$$\alpha = \underbrace{(\rho_{A,R} X_R)}_{\alpha_R} E(f_A) + \underbrace{(X_A - \rho_{A,R} X_R)}_{\alpha_{R\perp}} E(f_A) \quad (13)$$

where $\rho_{A,R}$ is the correlation between X_A and X_R .

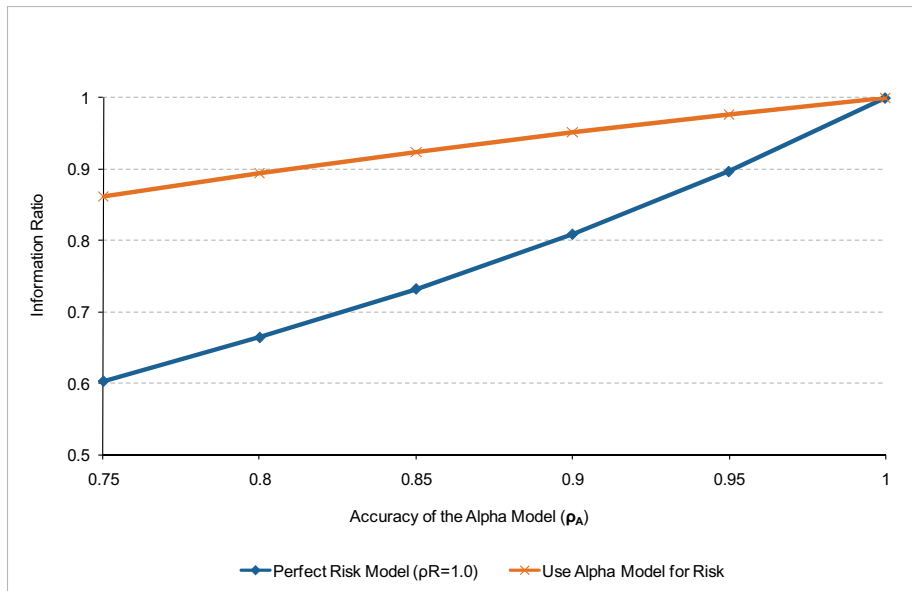
When the risk model is perfect, $\alpha_R = X \rho_A E(f_A)$ and $\alpha_{R\perp} = \varepsilon_A E(f_A)$. Thus, α_R is proportional to the true alpha, $X E(f)$, and $\alpha_{R\perp}$ is noise. Since the optimizer favors $\alpha_{R\perp}$ over α_R in building the optimal portfolio, it will favor noise over the true alpha! Paradoxically, the IR improves as the risk model becomes less accurate, in part, because more of $\alpha_{R\perp}$ is then true alpha¹⁸.

What happens if we employ the same model for both risk and alpha? We can do this by using a covariance matrix based on the alpha model:

$$\Sigma_A = \sigma_{f_A}^2 X_A X_A' + I_n \sigma_s^2 \quad (14)$$

where $\sigma_{f_A}^2$ is the volatility of the alpha model's factor. This eliminates the opportunity for the optimizer to exploit discrepancies between risk and alpha factors.

Figure 3: Aligning the Alpha and Risk Factor



As Figure 3 shows, using one model for both risk and alpha improves performance across the board. In this case, there is no orthogonal alpha, so the optimal portfolio weights are proportional to the manager's alpha, as may be seen from equation (13).

¹⁸More precisely, $\alpha_{R\perp} = \rho_A (1 - \rho_R^2) X E(f_A) + (\varepsilon_A - \rho_A \rho_R \varepsilon_R) E(f_A)$, where the first term is proportional to the true alpha and the second term is noise.

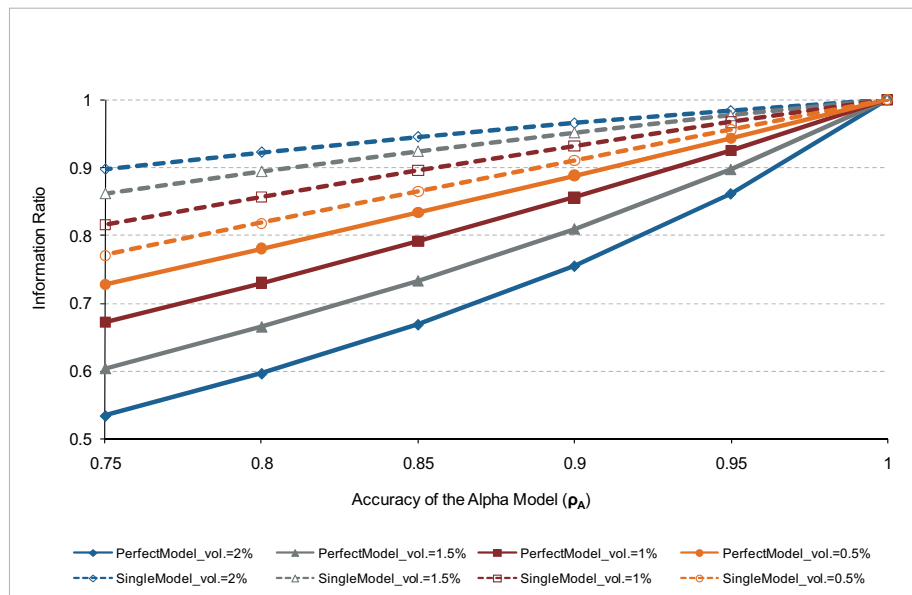
The information ratio of the optimal portfolio is:

$$IR = \frac{\rho_A E(f)}{\sqrt{(\rho_A \sigma_f)^2 + \frac{\sigma_s^2}{n}}} \quad (15)$$

Naturally, the IR falls as the accuracy of the alpha decreases. This is because a bet on the manager's alpha contains less true alpha but the same amount of specific risk as the accuracy worsens. When the factor volatility is large relative to average specific risk, however, the IR falls off more slowly – all else kept constant.

The amount to be gained by using one model depends, in part, on the strength of the factor. Figure 4 compares the performance achieved by a perfect risk model with that of a single model across a range of annual volatilities. The advantage is greatest when the factor volatility is strong and erodes as it weakens. Portfolios based on strong factors such as momentum may benefit more than those based on less volatile, fundamentals-based alpha factors.

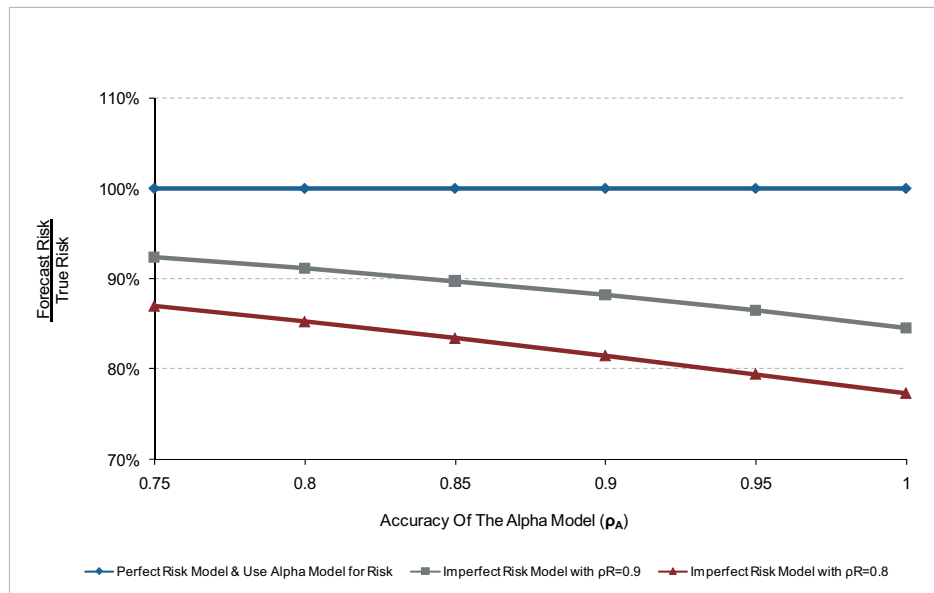
Figure 4: Factor Volatility Matters



So far, we have focused on the information ratio. Although using a single model improves the IR, does it do so at the expense of delivering a portfolio with the wrong risk level? Surprisingly, in our simple model the answer is no.

Figure 5 compares the accuracies of risk forecasts for portfolios formed using a perfect risk model, two imperfect risk models and a single model for risk and alpha. As expected, the imperfect risk models under forecast the risk of the optimal portfolios built using them. The single model, however, accurately forecasts the risk of its optimal portfolio. Care must be exercised in interpreting these results. The single model gets the risk forecast right only for portfolios containing all assets in the universe, where the weights are proportional the alphas. If we used a single model to optimize over a smaller number of assets, for example, the risk forecast would not necessarily be as good.

Figure 5: Risk Forecast Accuracy



V. Remedies

Given the MV Index’s risk adjusted performance and less extreme returns, it may be an attractive benchmark for investors with low volatility equity strategies such as corporate pension plans, insurance companies, or others. Some of these investors are increasingly concerned about balance sheet volatility in light of new regulations, such as FAS 158 and the Pension Protection Act. Both regulatory changes (and similar ones in Europe) have led to an increased focus on asset-liability-management (ALM) and liability driven investing (LDI) in recent years.

In this section, we investigate approaches for remedying - or at least mitigating- the problems that arise when a manager uses different models for risk and alpha. Along the way, we check whether insights from our analysis of the single factor case apply to more realistic situations.

We focus on a fairly common situation in which a few of the risk model factors resemble the alpha factors; we call these the “related risk factors”. Our proposed remedies attempt to reduce the misalignment between the alpha factors and their risk factor counterparts. They are as follows.

- (i) The manager may simply drop the related risk factors from the risk model. This is accomplished by setting all asset exposures to those factors to zero in the manager’s risk model.
- (ii) The manager may alter the risk model by simply substituting the alphas for the related risk factor exposures (i.e. swap X_{A_i} for the related X_{R_i}).
- (iii) The manager may use a risk model that replaces the related risk factors with the alpha factors and retains all other risk factors. This requires building a new risk model that includes the alpha factors.
- (iv) The manager may use his risk model to emulate the new risk model described in (iii) above.

While the first three alternatives above are straightforward, the last requires further explanation. The idea is to approximate the covariance matrix of a risk model that is based on the manager's alpha factors and the retained risk factors. Let X_C denote the set of exposures to the alpha and retained risk factors. Our emulated risk model has the following form:

$$\Sigma = X_C F_C X_C' + \Delta_R \quad (16)$$

where Δ_R is from the manager's risk model and F_C is an approximation of the covariance matrix of the new model's factor returns.

We define F_C by using factor portfolios. A factor portfolio is a portfolio that has unit exposure to a given factor, no exposures to other factors and minimum risk. For the factors of our new model, the asset weights of these portfolios are given by the rows of the matrix:

$$(X_C' W X_C)^{-1} X_C' W \quad (17)$$

where W is a diagonal matrix that typically reflects each asset's specific volatility¹⁹.

We define F_C to be the factor covariance of these factor portfolios. Using the manager's risk model, this is:

$$F_C = (X_C' W X_C)^{-1} X_C' W (X_R F_R X_R') W X_C (X_C' W X_C)^{-1} \quad (18)$$

To explore the effectiveness of these approaches, we apply the methodology used in the previous section to more realistic problems with several factors. We start by assuming that the Barra US equity model is the true model of returns, that its factor structure and covariance matrix describe reality perfectly. The model contains fifty five industries and thirteen style factors, two of which are value and momentum. We assume that the true model's exposures do not change over time²⁰.

We use separate models for risk and alpha. The alpha model is based on value and momentum. The risk model employs the same factors as in the US equity model. Both models estimate the exposures to value and momentum imperfectly and their errors are uncorrelated; the risk model knows all other factor exposures perfectly. As before, the risk model uses the true model of specific risk.

To keep things simple, the alpha model estimates momentum and value equally well and so does the risk model. This enables us to gauge the accuracy of each model with a single parameter reflecting the accuracies of its momentum and value exposures; we denote these accuracies ρ_A and ρ_R .

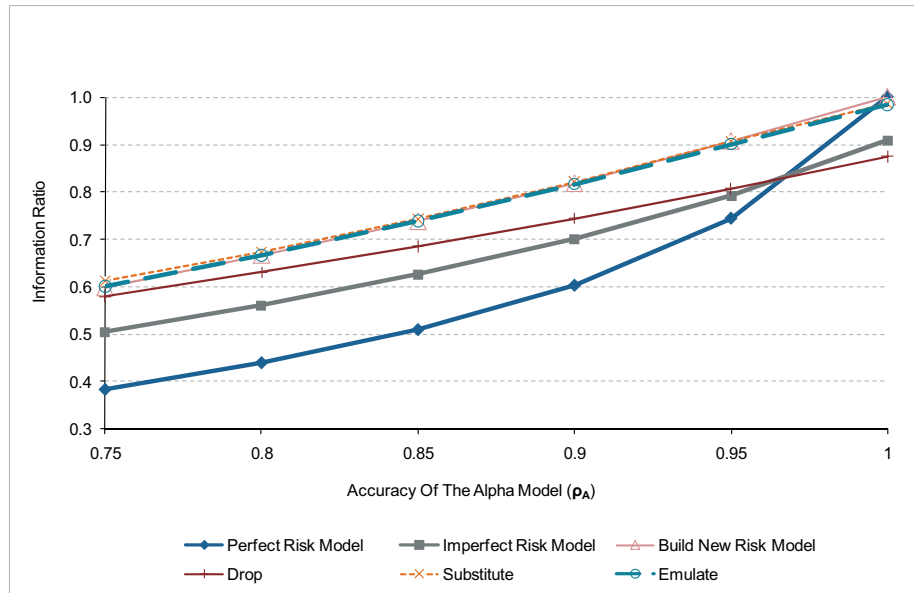
We run active optimizations using the S&P 500 as both the investment universe and the benchmark. We define the true alpha to be the equally weighted average of the Barra momentum and value exposures. The manager's alpha is the equally weighted average of the alpha model's estimate of value and momentum. In our examples, we assume that the manager's risk is 90% accurate.

¹⁹ In practice, W is defined in different ways. We simply set $W = I_n$. Our results are not materially affected by this choice.

²⁰ This assumption allows us to more easily construct the imperfect risk model and the risk model that includes the manager's factors and selected risk factors. As before, we ignore much of the estimation error in computing the factor returns.

We first perform unconstrained optimizations, allowing the optimizer to both long and short securities. Figure 6 shows the average results of a hundred simulations for each of the methods outlined above, comparing them to what could be obtained by using a perfect risk model and the manager's imperfect risk model. In each simulation run, we generate different value and momentum exposures for the alpha and risk models and re-estimate them. We use the true model to compute the ex-ante IRs of the optimized portfolios.

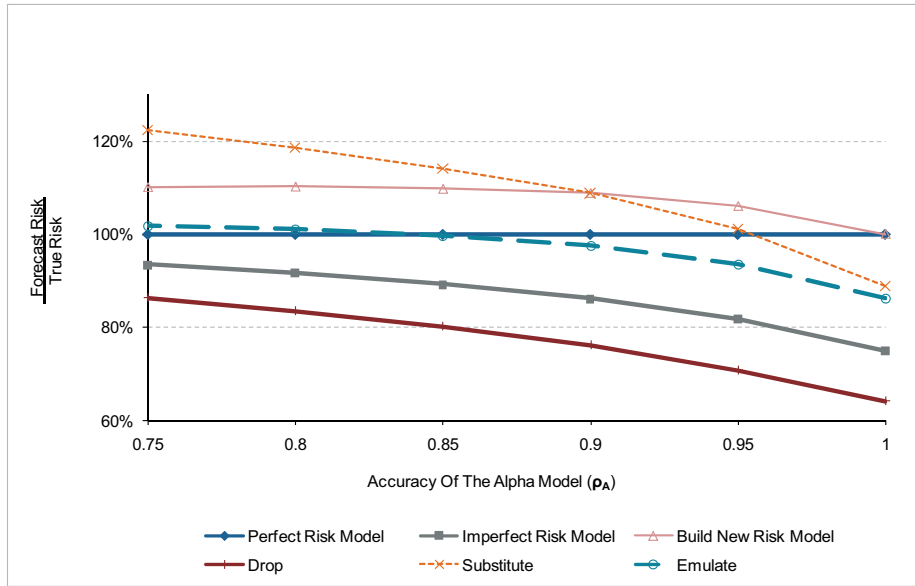
Figure 6: Comparison of Remedies: Long-Short Portfolios



As in our single factor study, we find that the perfect risk model performs worst unless the alpha is sufficiently accurate. Using an imperfect risk model or dropping risk factors helps for less accurate alphas. All three other approaches – substitution, building a new risk model and emulation – yield very similar and substantial improvements for a broad range of alphas. It is worth noting that substitution and emulation require significantly less effort, given that a risk model is already available.

The average accuracy of the active risk forecasts is shown in Figure 7. As expected, dropping risk factors or using an imperfect risk model leads to under estimates of risk. We see that the substitution approach over forecasts risk as the alpha degrades. This occurs because the manager's alpha carries less true factor risk as it becomes less accurate. The emulation approach under forecasts risk, especially when the alpha is accurate, because the risk model on which the emulation is based is imperfect. Finally, unlike in our simple model, building the alpha into the risk model produces forecasts of risk that are too high.

Figure 7: Risk Forecast Accuracy for Long-Short Portfolios



Many managers are subject to long-only constraints. To see how they are affected by these issues, we rerun the optimizations, this time disallowing short positions. Figure 8 shows the results for optimal portfolios targeted at active risk levels of 1.5% and 3%.

The impact of the misalignment between risk and alpha factors is not as great for the long-only managers. The gap between the best and worst performing approaches narrows when we disallow shorting. Interestingly, at higher risk levels these differences become smaller still.

Figure 8A: Comparison of Remedies: Long Only Portfolios with 1.5% Active Risk

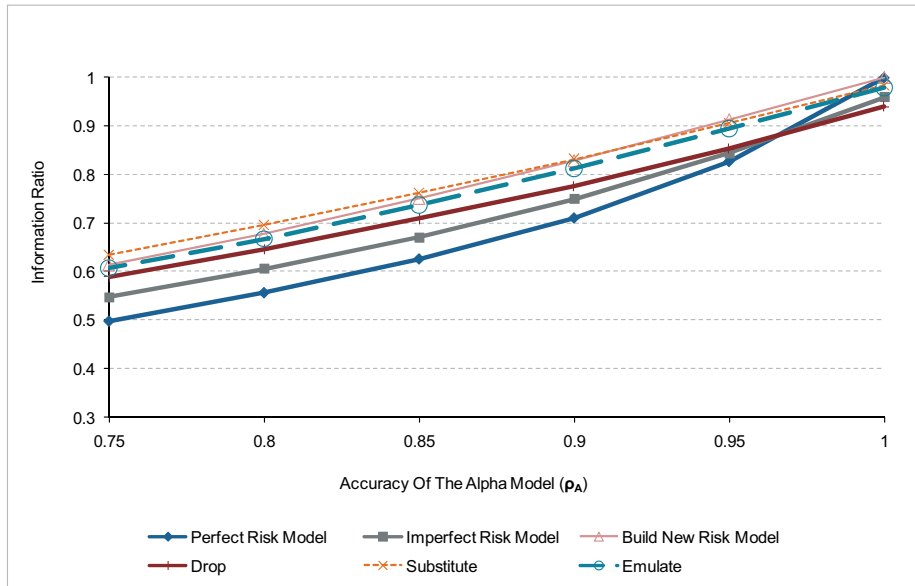
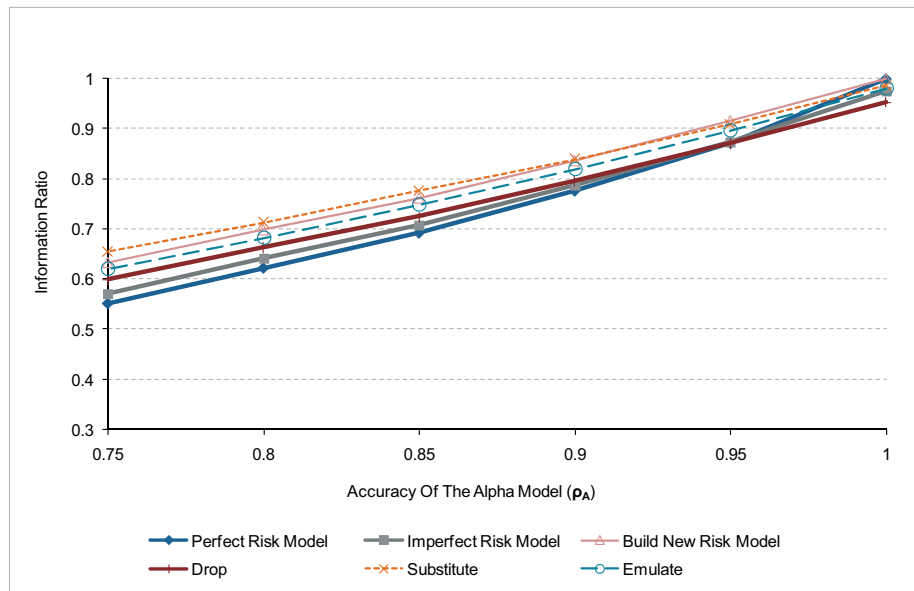


Figure 8B: Comparison of Remedies: Long Only Portfolios with 3% Active Risk



VI. Summary

There are potential pitfalls in using one factor model to forecast risk and another to forecast alpha in portfolio optimization. Both models capture systematic sources of return and risk. We have shown that discrepancies between risk and alpha factors can create unintended bets in optimized portfolios that may hamper performance.

Aligning risk and alpha factors may improve the quality of optimized portfolios. We can achieve this by building a risk model that explicitly incorporates the alpha factors. Alternatively, we can emulate such a model using an existing risk model. In our problems, we find that both approaches improve the information ratio of optimized portfolios.

While we have provided a framework for understanding these issues, further study is needed to get a better sense for their impact on everyday portfolio optimization. We have made certain simplifications such as ignoring much of the noise in estimating the covariance matrix in order to concentrate on the main points. In practice, such factors might diminish some of the effects that we have observed.

Lastly, our studies have illustrated cases in which the risk and alpha models use the same factors but measure exposures to them differently. The same analysis can be extended to include situations where the alpha model contains factors that are missing from the risk model.

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Far From the Madding Crowd – Volatility Efficient Indices

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Abstract

Minimum-variance and managed volatility equity strategies have been around since the early 1990s but have recently gained popularity. Since minimum variance strategies do not require return forecasts, they may be in some cases more efficient than strategies that trade off expected risk and return. Moreover, new pension regulations in the US and abroad have led to increased aversion against asset volatility. We developed a global minimum volatility (MV) index that can serve as a transparent and relevant benchmark for managed volatility equity strategies. Our MSCI Global Minimum Volatility Index performance profile is consistent with earlier studies of minimum variance portfolios for US and European markets. The simulated MSCI MV World Index experienced approximately 30% lower volatility than the MSCI World Index over the period January 1995 to October 2008. Its performance, measured by the Sharpe ratio, was 0.34 vs. 0.17 for the MSCI World Index during this period.

Introduction

With the recent increase in equity volatility, combined with legislation and accounting changes that require mark-to-market of asset values at pension plans and insurance companies, a number of 'managed volatility' equity strategies have emerged. These strategies focus on absolute return and volatility instead of active return and tracking error relative to a standard equity benchmark. The so-called 'minimum variance' strategy, which harkens back to the well-known minimum variance portfolio (MV) represents the extreme form of such equity strategies. In fact, the MV portfolio can be viewed as a passive managed volatility strategy. In this paper, we explore the merits of developing a global minimum volatility (MV) index that can function as a benchmark for managed volatility strategies.

In Section 1, we provide a brief overview of the MV portfolio in its theoretical context and review the existing literature dealing with empirical analysis of MV portfolios. A number of studies, most focused on the US and other domestic markets, report realized superior risk adjusted returns for the MV portfolio over capitalization weighted market indices during different economic cycles. In Section 2, we describe how to construct a MV Index given a number of constraints that aim to make the MV Index a relevant benchmark for managed volatility strategies. Next, we report our results and the characteristics of the global MV Index. We compare this MV Index to the MSCI World Index as well as a long duration fixed income (FI) index, a benchmark for less risky long-term investments and proxy for long duration liabilities. In Section 3, we conclude the paper with a discussion of possible applications of a global MV Index.

I. The Minimum Variance Portfolio

The theoretical minimum variance (MV) portfolio has been widely known since Markowitz's seminal paper in 1952²¹. The MV portfolio is positioned on the very left tip of a mean-variance efficient frontier and describes an equity portfolio with the lowest return-variance for a given covariance matrix of stock returns. While all other portfolios on the efficient frontier minimize risk for a given expected return, the MV portfolio minimizes risk without an expected return input.

The Capital Asset Pricing Model (CAPM) (see Sharpe, 1964) expanded on the ideas of Markowitz and developed the concept of the mean-variance efficient market portfolio – the only portfolio of risky assets an investor should hold (given a strict set of assumptions)²².

²¹ See Markowitz, H. (1952), Portfolio Selection, Journal of Finance, 7

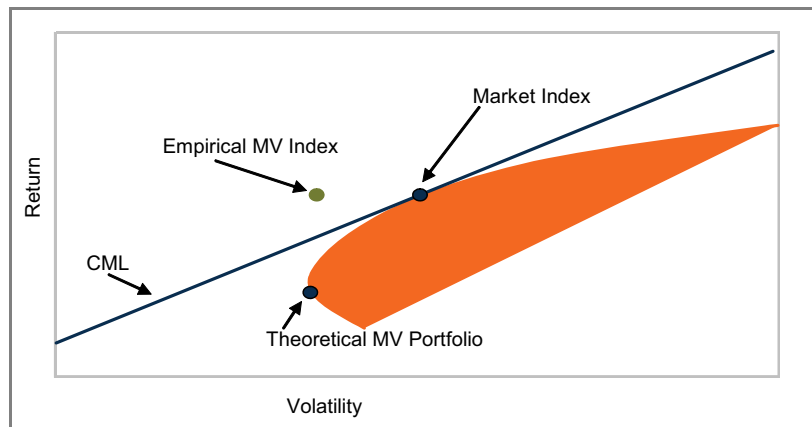
²² Sharpe, William (1964), Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk, Journal of Finance, 19

Combining the market portfolio with a risk free asset²³ will then allow the manager to achieve the desired risk level. Capitalization weighted equity indices like the MSCI World Index for global equity investors often function as a proxy for the market portfolio. Thus, if an investor wants to maximize return per unit of risk, the market portfolio or any combination of the market portfolio and cash dominate the MV portfolio according to the CAPM.

Of course, in practice, the CAPM has not always stood up well to empirical evidence. Academics and investment professionals agree that many of the underlying assumptions of the CAPM did not pass the test of empirical studies, and that the proxy for the market portfolio may not be mean-variance efficient itself. Exhibit 1 illustrates an efficient frontier and the capital market line as a combination of the risk-free asset and the market portfolio, represented by a capitalization weighted, well-diversified index.

In Exhibit 1, we also illustrate an Empirical MV Index, reflecting the observation that the bulk of empirical studies report superior realized risk-adjusted performance for the MV portfolio relative to capitalization weighted market indices.

Exhibit 1: Efficient Frontier and Empirical MV Index results



The results of these studies suggest that the CAPM does not hold in practice or at least that the capitalization weighted proxy for the market portfolio may not be a truly efficient investment.

What are some of the characteristics of empirical minimum-variance portfolios? Across a number of empirical studies, MV portfolios show a number of common characteristics that may also explain their historically superior risk adjusted returns²⁴:

- Low Portfolio Beta, in the order of 0.7, relative to a capitalization weighted market index
- Approximately 30% less portfolio volatility than the capitalization weighted market index
- Bias towards stocks with lower market capitalization than the average company within the capitalization weighted market index
- Bias towards stocks with low total and idiosyncratic risk
- Often a bias towards value oriented companies

Thus, one reason why MV portfolios have historically exhibited strong realized risk adjusted performance may be their lower cap and value biases relative to a capitalization weighted index. A second reason may be their bias towards low idiosyncratic risk. Recent studies report that stocks with low idiosyncratic risk outperformed stocks with higher risk

²³ The different combinations of a risk free asset and the market portfolio form the tangent, known as the capital market line (CML).

²⁴ The original study was published by Haugen in 1990 for the US. In 1995 Kleeberg showed similar results for international markets. In 2006 Clarke et al, repeated Haugen's tests for longer and more recent periods.

over long periods²⁵. A third reason may be the lower absolute return volatility of the MV portfolio. Lower volatility combined with comparable average monthly performance leads to higher long-term compounded (geometric) returns relative to a more volatile return series.

Last, but not least, a common explanation for the superior realized risk adjusted performance of the MV portfolio has to do with the practical challenges of constructing efficient portfolios. Past studies suggest that accurately estimating risk may be a more straightforward task than estimating expected returns.²⁶ Moreover, Chopra and Ziemba (1993) examined the relative impact of estimation errors in means, variances, and covariances. They found that errors in means are more than ten times as important as errors in variances and errors in variances are about twice as important as errors in covariances.²⁷ As a result, the minimum variance portfolio, which does not rely on expected return forecasts, might be the best way at creating an efficient portfolio and empirical studies point in that direction²⁸.

II. The MSCI Minimum Volatility World Index

Construction Methodology

In this section, we describe our methodology for constructing a global minimum-volatility (MV) index based on the MSCI World Index security universe. The critical input in a MV Index is the risk estimate, the covariance matrix of equity returns. While return history can be used to create this sample covariance matrix, a more robust covariance matrix would take into account errors in estimation that arise from using pure historical returns. Hence, we use the global equity covariance matrix from the Barra Global Equity Model (GEM) as our input²⁹.

A major consideration for the construction of the MV Index is investability and replicability under realistic assumptions. Consequently, we implement a number of rules to ensure these two objectives and rebalance the MV Index semi-annually with the following constraints³⁰:

- The index is un-hedged and constructed from a US dollar perspective³¹
- The maximum weight of an index constituent is constrained to 1.5%.
- The minimum weight of an index constituent is constrained to 0.05%.
- The GICS sector weights of the MV Index are constrained to +/-5% around the GICS sector weights of the MSCI World Index.
- The country weights of the MV Index are constrained to +/-5% around the country weights of the MSCI World Index.
- The Barra risk index exposures of the MV Index are constrained to +/- 0.25 standard deviations around the Barra risk index exposures of the MSCI World Index.³²
- The one-way index turnover is constrained to a maximum of 10% per semi-annual rebalancing.

²⁵ See Ang et al (2006a), and Ang et al (2006b). For their analysis using U.S. data, the sample period is July 1963 to December 2003. For the international data, the sample period is January 1980 to December 2003. Stocks with recent past high idiosyncratic volatility had low future average returns around the world, on average, across 23 developed markets, the difference between the extreme quintile portfolios sorted on idiosyncratic volatility was 1.31% per month in favor of the low volatility quintile.

²⁶ Jagannathan and Ma (2003), for example, comment that the estimation error in expected returns is so large that nothing much is lost in ignoring them altogether.

²⁷ See Chopra, Vijay K. and William T. Ziemba (1993). They point out that errors in expected return forecasts have a 10 times larger impact on portfolio construction than errors in the estimation of the co-variances across assets

²⁸ See Jorion (1986), Jagannathan and Ma (2003), DeMiguel et al. (2005). All show empirical evidence that the minimum-variance portfolio performed better out-of-sample than any other mean-variance portfolio.

²⁹ For details on the Global Equity Model please go to www.msccbarra.com/products/models/global.jsp

³⁰ We also simulated an unconstrained MV index and indices with different constraints and rebalancing frequencies. Results of these simulations are available on request.

³¹ A different base currency would lead to a different MV index, i.e., the US dollar based MV Index is the minimum volatility index only for US dollar based investors.

³² The Barra risk indices are SIZE, VALUE, MOMENTUM, and VOLATILITY. Their exposures are Z-scores with a mean of zero and standard deviation of 1.

Given these constraints, we constructed the MSCI World MV Index from January 1995 to October 2008³³ using the MSCI Barra Aegis optimizer³⁴. Next, we present the performance characteristics of this MSCI World MV Index.

Performance Characteristics of the MSCI Minimum Volatility World Index

Exhibit 2 shows the cumulative returns over the entire period for the global MV Index against the MSCI World Index and a long duration US Fixed Income Index. The latter is constructed using government bond issues with more than 10 years to maturity. The MSCI MV Index realized somewhat higher returns than the MSCI World Index over the period from January 1995 to October 2008 with nearly 30% lower volatility.

As one might expect, the MSCI World Index delivered superior returns during the tech boom and internet bubble of the late 1990s. However, the MSCI World Index performed much worse than the MV Index when the bubble burst. From the top of the tech boom in March 2000 to the bottom in March 2003, the MSCI World Index lost 45% whereas the MSCI MV Index lost less than 18%. Similarly, during the current financial and economic crisis the MSCI World underperformed the MSCI MV Index in 2008 by 15% as of the end of October.

The other intriguing result is that the two indices performed very similarly during the periods from January 1995 to November 1998, and from April 2003 to December 2007. In other words, during the period of steep decline the MV Index indeed offered downside protection relative to a capitalization-weighted index but kept up with the standard index during up-markets in the mid 1990s and 2000s.

Exhibit 2: Cumulative Excess Returns from January 1995 to October 2008

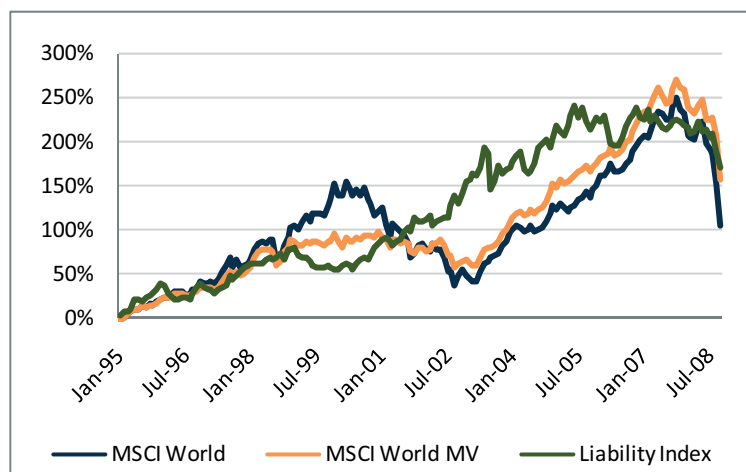
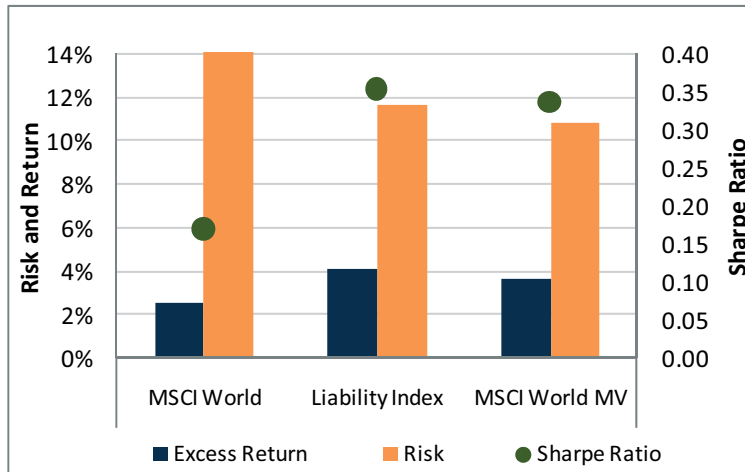


Exhibit 3 highlights the superior performance per unit of risk of the MSCI MV World index over this period. The higher Sharpe Ratio of the MV Index, defined as annualized excess return (in excess of 1 month T-Bill) divided by realized annualized volatility, can be explained mostly by the lower volatility relative to the MSCI World Index. The long duration bond index delivered lower returns combined with lower risk, resulting in a Sharpe Ratio comparable to the MSCI World Index.

³³ The official history for the MSCI MV index starts in December 1998. The period from January 1995 to November 1998 is based on a simulated research history of the parent index.

³⁴ A detailed methodology guide for the construction and maintenance of the MV Index is available on request.

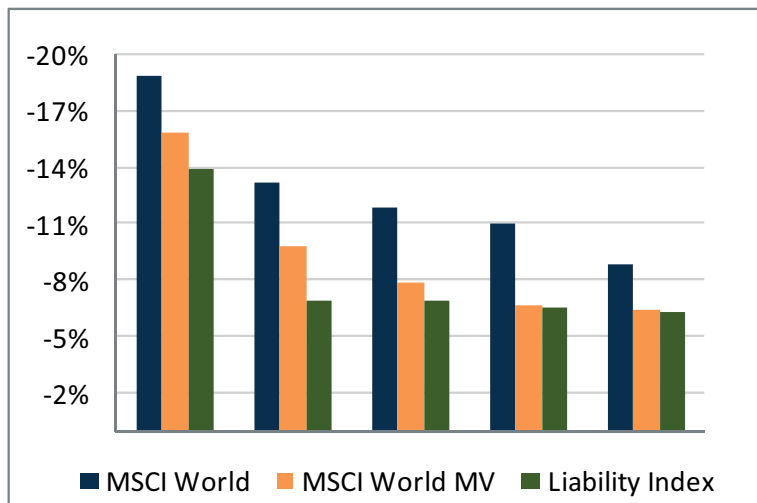
Exhibit 3: Annualized Risk and Return Comparison



The MV Index realized risk over this period was lower than the level of the Fixed Income index, i.e., 10.88% vs. 11.66% p.a., respectively, whereas the MSCI World Index experienced risk of 14.80% annualized. Even though, the MV Index is fully invested in equities its absolute level of volatility was more comparable to long duration fixed income or long liability streams, as approximated by the long duration fixed income index.

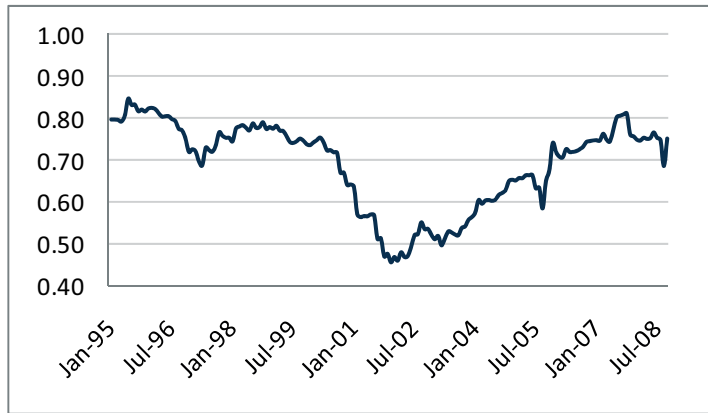
An important objective of low volatility equity investing is its downside protection relative to a market index. Exhibit 4 looks at the 5 worst performing months for the three indices over the period from January 1995 to October 2008. The monthly MSCI World MV Index losses are closer to the biggest fixed income index declines over this period.

Exhibit 4: Worst five monthly returns from January 1995 to October 2008



Finally, we look at the beta of the MSCI MV Index against the MSCI World Index. As expected, the beta, measured as a rolling 36-month historical beta, is consistently below one and varied between 0.8 and 0.5.

Exhibit 5: MSCI MV World 36 month rolling Beta vs MSCI World



Interestingly, the MV Index seemed to have offered a natural hedge against increasing market volatility. The beta declined rapidly during the late 1990s and early 2000s when market volatility skyrocketed and is decreasing again in the current environment.

Characteristics of the MSCI Minimum Volatility World Index

Next, we investigate the MSCI MV World index characteristics in more detail. Exhibit 6 shows the exposures to the three regions over time. The MSCI World MV index under-weighted Europe most of the time and over-weighted Asia Pacific. The Americas weight is on average relatively close to the MSCI World Index but varies during this period.

The main reason for the lower Europe weights was the exchange rate volatility between the Euro and USD whereas currency risk in Asia had been more muted over most of the last 12 years, making Asia Pacific relatively more attractive for managed volatility equity strategies³⁵.

Exhibit 6: Regional Weights Relative to the MSCI World Index

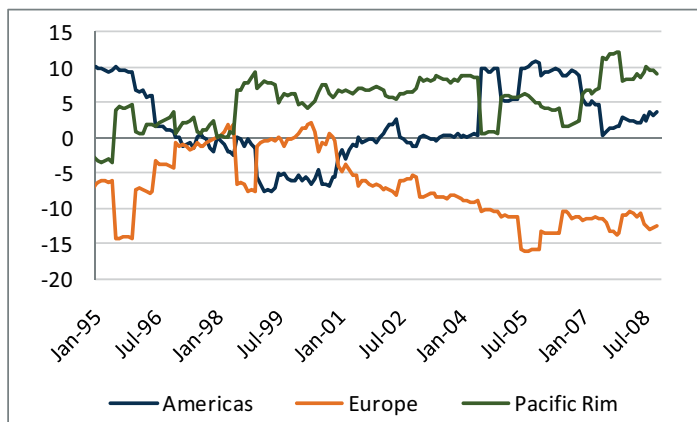
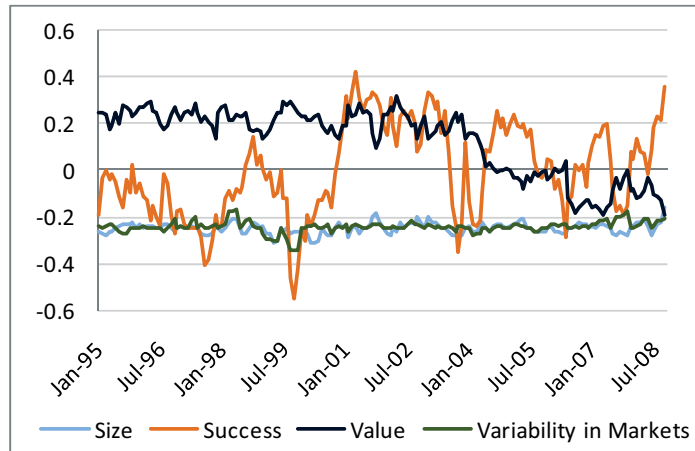


Exhibit 7 demonstrates the evolution of the style index exposures over time. The constraint of +/- 0.25 standard deviations at each semi-annual rebalancing controlled the index from moving more towards smaller stocks within the MSCI World universe and stocks with lower historical volatility as measured by VIM (Variability in Markets).

³⁵ If the base currency for the MV index were Euro, the resulting MV index would be different and Asia and the US would likely be underweighted relative to Europe.

Exhibit 7: MSCI World Minimum Volatility Index Style Exposure



This bias towards smaller and less volatile stocks is in line with previous studies. More surprising is the move away from 'Value' during the recent bull market from 2003 to 2007, an indication that value stocks have become more volatile in recent years and therefore lost their appeal for the MV Index.

We conclude that the performance characteristics of the MSCI MV World index are very much in line with previous studies focusing on domestic minimum variance portfolios. In the next section, we discuss the performance characteristics of Minimum Volatility indices around the world.

III. MSCI Minimum Volatility Indices around the World

MSCI Barra launched a US and World version of the Minimum Volatility Index family but we simulated indices for several other regions, including Europe and Emerging Markets. Using the same construction methodology as described in section II, we created the indices for the period from December 1998 to October 2008. Exhibit 8 shows a number of summary statistics for the Minimum Volatility indices and their respective MSCI Standard index. The results are very much in line with our findings for the MSCI World Minimum Volatility index over this period:

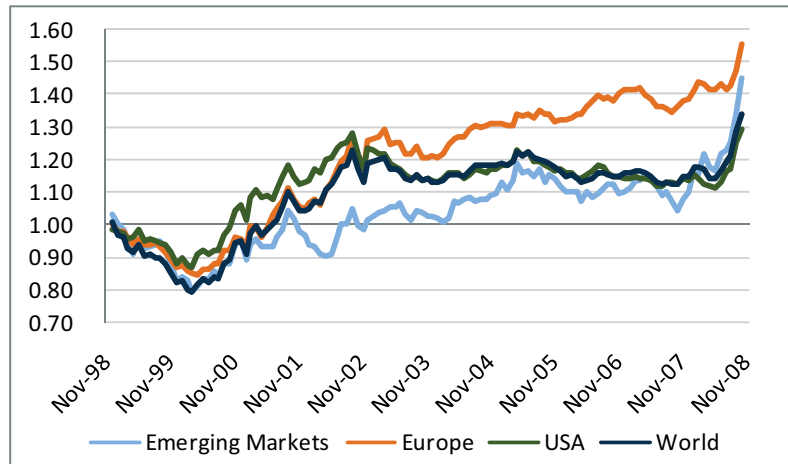
- 30% less volatility for the MSCI Emerging Markets Minimum Volatility in line with the MSCI World Minimum Volatility Index
- 20% to 25% lower volatility for the MSCI USA and MSCI Europe Minimum Volatility Indices
- High Tracking error ranging from 6.5% for the MSCI USA Minimum Volatility Index to more than 10% for the MSCI Emerging Markets Minimum Volatility relative to their respective MSCI Standard Indices.
- The lower volatilities combined with superior returns over this period led to significantly better Sharpe ratios for these four Minimum Volatility indices.

Exhibit 8: Risk and Return Characteristics of MV Indices around the World

12/1998 - 10/2008	Excess Return	Volatility	Volatility Redux	Sharpe Ratio	Tracking Error	Info Ratio
MSCI Emerging Markets	6.13	23.86		0.26		
MSCI EM MinVol	10.29	16.56	30.60%	0.62	10.22	0.41
MSCI USA	-3.82	15.34		-0.25		
MSCI USA MinVol	-1.58	11.44	25.42%	-0.14	6.52	0.34
MSCI Europe	-1.88	17.31		-0.11		
MSCI Europe MinVol	2.71	13.69	20.91%	0.20	7.44	0.62
MSCI World	-2.71	15.12		-0.18		
MSCI World MinVol	0.93	10.33	31.68%	0.09	7.54	0.48

Most surprising is the superior return of the Minimum volatility strategies and the majority of the outperformance was achieved during 2008 when markets around the world fell by 30% to 40%. Exhibit 9 confirms the similarity of the characteristics of this strategy around the world. It shows the performance of the Minimum Volatility Indices relative to their respective MSCI Standard Indices. All four MV indices underperformed during the technology bubble, outperformed strongly during the burst of the bubble and the current crisis, and performed very similar during less extreme periods.

Exhibit 9: Relative Performance of Minimum Volatility Indices



IV. Applications

Given the MV Index’s risk adjusted performance and less extreme returns, it may be an attractive benchmark for investors with low volatility equity strategies such as pension plans and insurance companies. Some of these investors are increasingly concerned about balance sheet volatility in light of new regulations, such as FAS 158 and the Pension Protection Act. Both regulatory changes (and similar ones in Europe) have led to an increased focus on asset-liability-management (ALM) and liability driven investing (LDI) in recent years.

To quantify the impact of low volatility investing on the overall level of risk for a typical asset allocation of 60% equity and 40% fixed income, Exhibit 10 illustrates the result for two asset allocations using the MSCI World index and the MSCI MV Index as the respective equity components. For the ‘traditional’ asset allocation, we use the MSCI World Index as the equity element and the US Fixed Income government index. For the MV asset allocation, we use the MSCI World MV Index and the same US Fixed Income Index.

Exhibit 10: Asset Allocation Using the MSCI World and MSCI World MV Indices

December-07	Asset Allocation	Traditional Asset Allocation Risk	MV Asset Allocation Risk	Risk Reduction
Equity	60%	12.1%	8.8%	27%
Fixed Income	40%	8.0%	8.0%	0%
Total	100%	7.0%	5.8%	18%
April-01	Asset Allocation	Traditional Asset Allocation Risk	MV Asset Allocation Risk	Risk Reduction
Equity	60%	14.7%	10.8%	27%
Fixed Income	40%	7.2%	7.2%	0%
Total	100%	9.4%	7.2%	23%

We compare the historical risk levels for the asset classes and the combined portfolios for two dates: December 2007 and April 2001³⁶. The results confirm that the MV allocation decreases the risk of the 60/40 asset allocation by roughly 20% relative to the 'traditional' asset allocation across the two periods.

Over the last few years a number of asset managers have launched Minimum Volatility or managed volatility products. One of their main challenges has been to find the right benchmark. A capitalization weighted index behaves very differently than low volatility strategies as the high tracking errors for the MSCI MV indices relative to their respective MSCI Standard indices indicate. Another possible benchmark may be LIBOR plus X as one might argue that minimum volatility investing is an absolute return strategy. But absolute return investing is commonly understood to be long/short investing with little to none market exposure. A minimum volatility index like the MSCI Index family closes this gap and allows low volatility managers to be benchmarked against an index that exhibits similar characteristics than the managers' strategies.

V. Summary

Minimum-variance and managed volatility equity strategies have been around since the early 1990s but have only recently gained popularity in the US. Since these strategies do not require return forecasts, they may be in some cases more efficient than strategies that trade off expected risk and return. Moreover, new pension and insurance regulations in the US and abroad have led to increased aversion against asset volatility. Higher volatility has increased the focus on managed volatility equity strategies. Thus, the MSCI Minimum Volatility Index would serve as a transparent and relevant benchmark for such strategies.

In the past, most studies of minimum-variance portfolios and strategies have focused on domestic or regional markets. Here, we extend this to a global universe. The MSCI World MV Index shows strong risk adjusted performance compared to a "market" proxy, the MSCI World Index, as well as the long duration FI index. In addition, our analysis of its characteristics confirmed that the MSCI World MV index performance profile is consistent with earlier studies of minimum variance portfolios for US and European markets. The MSCI World MV index experienced approximately 30% lower volatility than the MSCI World Index over the period January 1995 to October 2008. Its performance, measured by Sharpe ratios, was superior relative to the MSCI World Index--0.34 vs 0.17³⁷.

³⁶ Volatility has been calculated based on an exponentially weighted covariance matrix, estimated with a half-life of 36 months.

³⁷ The Sharpe ratios are calculated before transaction costs. Keeping in mind that the turnover for the MV Index was constrained to 10% per semi-annual rebalancing, transaction cost would have no material impact on the reported results.

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Portfolio of Risk Premia: A New Approach to Diversification

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Dan Stefek

Abstract

Traditional approaches to structuring policy portfolios for strategic asset allocation have not provided the full potential of diversification. Portfolios based upon a 60/40 allocation between equities and bonds remain volatile and dominated by equity risk. In this paper, we introduce a different approach to portfolio diversification. This approach looks at structuring portfolios using available risk premia within the traditional asset classes or from systematic trading strategies rather than focusing on classic betas such as equities and bonds. We start by reviewing the various ways of dissecting asset classes into their underlying systematic drivers or risk premia and analyze the historical risk and return patterns for a number of risk premia across asset classes. In a second stage, we illustrate empirically that correlations between risk premia have been low, offering significant diversification potential. We then confirm the benefits of diversification with a simple asset allocation case study by comparing a typical 60/40 equity/fixed income allocation with an equal weighted allocation across eleven style and strategy risk premia. From 1995 to 2008, this simple combination had returns similar to the traditional allocation but with 65% less volatility.

Introduction

Classic asset allocation combining equities and bonds is not diversified enough and is characterized by high volatility. The previous down market in 2001-2003 amply demonstrated this phenomenon, which was subsequently analyzed by Leibowitz (2004) and Qian (2005). The consequence has been a gradual shift of strategic allocations towards alternative asset classes, such as private equity, hedge funds or commodities. However, these new allocations only partially addressed the problem as the 2008 crisis glaringly revealed. Some alternative segments did not provide the needed diversification. For example, private equity may provide diversification if portfolios are composed of uncorrelated high alpha funds but in reality, the beta component of private equity is structurally dependent on equity market returns and interest rates. In addition, the majority of hedge funds are long / short equity funds whose returns incorporate a big element of classic equity beta. Furthermore, many fixed income hedge fund strategies are variants of a simple credit exposure trade. More granular allocations within the equity or bond asset classes are no solutions, either, since the resulting portfolios are still exposed to the common equity market return or the general level of interest rates.

Investors also tried constructing portable alpha portfolios, in the hopes that alpha produced by many managers would provide uncorrelated returns. However, capturing alpha is notoriously difficult. As a result, what tends to matter most are asset allocation decisions and beta returns.

In an ideal world, a portfolio would be composed of a wide range of return-producing units, each of which is risky but independent of the others. Such a portfolio would result in high returns with low volatility. The return-producing units would also have capacity large enough for allocations by large funds. So, how can we identify these independent, return-producing units?

The answer is deceptively simple. These return-producing elements or risk premia exist in the traditional asset classes and are identified by fundamental factors. They just need to be separated from assets dominated by the equity market or interest-rate return.

We illustrate our concept of risk premia using the example of small cap equities. An investor investing in a small cap portfolio gets the equity market return plus the small cap risk premium. Exposure to the more risky small cap assets justifies this additional return.

Since investment management advances allow for easy and cost effective ways to hedge market beta, accessing the pure small cap premium can be accomplished with a portfolio that is long small caps and short large caps. That portfolio captures the small cap risk premium.

Similarly, in the bond world, a high yield portfolio provides the government bond return for similar maturities plus the risk premium associated with the riskier high yield bonds. A portfolio long in high yield bonds and short in government bonds captures the high yield risk premium.

Finally, some strategies that aim to capture a specific risk premium through the execution of systematic trading rules also qualify for the risk premium approach. Arbitrage strategies such as merger arbitrage or convertible arbitrage qualify under that scheme. Being rules-based, these strategies can be replicated in a cost effective way and avoid risk associated with the selection of active managers.

The main objective of this paper is to better understand the risk and return characteristics of risk premia, first as standalone entities and second in the context of a portfolio of risk premia.

We first define a set of requirements that a risk premium has to satisfy and identify a number of risk premia across asset classes. We then discuss how one might create investable indices that capture risk premia. Next, we highlight the possible benefits of a well-defined and investable set of risk premia with an asset allocation case study. We conclude with an outlook on future research focusing on the development of a broad range of risk premia indices.

I. Definition of and Examples for Risk Premia

A risk premium is typically defined as the expected investment return in excess of the risk-free rate³⁸. The risk premium compensates investors for the additional risk relative to a risk-free investment. We categorize risk premia into those arising from asset-class, style, and strategy, and use the concept of betas, which in combination capture a portfolio's systematic return.

In our terminology, asset-class beta for a portfolio captures the expected return coming from a particular asset class. For a particular portfolio, it is defined more precisely as the product of the risk premium for a particular group of assets, such as equities, and the relationship of the asset group's return to its benchmark return (the latter being the more traditional definition of beta). For example, the long term equity risk premium historically has been around 6% and many long only equity mandates have a traditional beta of roughly one, leading to the asset-class beta for equities, according to our definition, to be 6%. In a similar vein, style betas describe the systematic return coming from individual security characteristics like book-to-price ratio of equities or the credit spread of fixed income securities. The style beta of a portfolio captures the expected return coming from the risk premium of the style multiplied by the exposure of the portfolio to the respective style. Next, strategy betas capture the systematic return derived from replicating investment strategies. An example is the merger arbitrage strategy where the manager invests in the target and shorts the acquirer. Such arbitrage strategies often results in a traditional beta close to zero and small style exposures. The risk premium compensates for the uncertain outcome of the merger, i.e., only if the merger succeeds earns the strategy a profit. Finally, the non-systematic source of portfolio return is alpha. These four components can explain the total return of an investment:

Return	=	Asset - Class Beta	+	Style Beta	+	Strategy Beta	+	Alpha
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³⁸ For example, US investors often use the 1-month Treasury-Bill as the risk-free rate.

The systematic component of, for example, an equity portfolio return can be broken down into the sum of its risk premia: The traditional beta with respect to a market index times that index's return, and its exposures to certain styles like Value, Size, and Momentum times the respective styles' returns. In contrast, a merger arbitrage strategy exhibits little exposure to the equity market or styles but its systematic portfolio return may be explained largely by its strategy Beta. A more granular categorization of traditional and alternative Beta sources is described in Anson (2008).

Well-known risk premia within the equity class include the equity risk premium, as well as Value, Small Cap, and Momentum. Other asset classes, including fixed income, real estate, and commodities, also demand risk premia above the risk-free rate. Similar to equities, there are distinct risk premia within those asset classes. Examples include term structure, credit, and high yield spread factors. Liquidity and volatility are harder to identify and replicate but are important sources of risk and return for most alternative asset classes and many hedge funds strategies.³⁹ Exhibit 1 classifies a number of risk premia across asset classes.

Exhibit 1: Risk Premia across Asset Classes

Asset Class	Asset - Class Beta	Style Beta	Strategy Beta
<i>Equity</i>	Broad Equity Markets	Size Value Momentum	Merger Arbitrage
<i>Fixed Income</i>	Broad Fixed Income Markets	Credit Spreads High Yield Spread Term Structure Spread	Convertible Arbitrage
<i>Currency</i>	Broad Currency Markets		Carry Trade Momentum Value

Exhibit 1 is just provided for illustrative purposes; the framework can capture other asset classes such as commodities or real estate as well as a number of additional style and strategy risk premia within asset classes.

Historically, style and asset class betas have been bundled together. For example, the MSCI Value Index offers exposures to both the equity market and to the value risk premium. Isolating exposure to a style beta can be achieved by going long on one dimension of a style and short the opposite dimension. For example, exposure to the value premium may be achieved by going long the MSCI Value Index and short the MSCI Growth Index. Such a long/short combination would eliminate most of the market exposure and effectively capture the value risk premium.

Exhibit 2 demonstrates ways to capture different well-researched style and strategy risk premia. However, the list is not meant to be comprehensive and different methods to capture risk premia are possible.

³⁹ We do not treat hedge funds as a separate asset class but look at certain hedge funds strategies within the existing asset classes, e.g., a merger arbitrage is viewed as a strategy risk premium within equities.

Exhibit 2: Ways of capturing different Risk Premia – An Illustration

Risk premium	Long Position	Short Position
Value	MSCI World Value	MSCI World Growth
Size	MSCI AC World Small Cap	MSCI AC World Large Cap
Momentum	World Momentum (simulated)	MSCI World
Credit Spread	Merrill Lynch US Corporate (AAA)	Merrill Lynch US Treasury
High Yield Spread	Merrill Lynch High Yield US Corporate	Merrill Lynch High Quality US Corporate
Term Spread	Merrill Lynch US Treasury 10+ years	Merrill Lynch US Treasury 1-3 years
Merger Arbitrage	Target	Acquirer
Conv Arbitrage	Convertible Bond	Underlying Stock
Currency Carry Trade	3 Highest Interest Rate G10	3 Lowest Interest Rate G10
Currency Value	3 Most Undervalued G10	3 Most Overvalued G10
Currency Momentum	3 Best Performing G10	3 Worst Performing G10

Many style betas can be created simply through long/short combinations of existing indices, whereas there are only few strategy risk premia available as investable indices, yet. MSCI Barra has simulated the Strategy Beta indices as well as the Equity Momentum Style index. The different methodologies for the simulated indices are explained in Appendix A.

I. Risk and Return Characteristics of Risk Premia

We next examine the risk and return characteristics of the different asset-class, style, and strategy risk premia over the period May 1995 to October 2008. Exhibit 3 shows annualized returns and realized annualized volatilities, as well as the Sharpe ratio and maximum drawdown. The Sharpe Ratio is defined as the annualized excess return over the annualized volatility. Maximum drawdown is the maximum cumulative loss during an uninterrupted down market, i.e., the worst difference between market peaks and troughs over different market cycles.

Over this period, the strategy risk premia, particularly merger arbitrage, currency carry trade, and currency value strategies, performed well on a risk-adjusted basis; all have realized Sharpe ratios above 0.75. Recently, asset-class based and style premia indices have been negatively impacted by the financial crisis, particularly in October 2008 as we will discuss later.

Exhibit 3: Risk and Return Profiles of selected Risk Premia – 5/1995 to 10/2008

Style / Strategy Beta	Risk Premium	Annualized Premium	Annualized Volatility	Sharpe Ratio	Maximum Drawdown
Style	Value	1.6%	8.3%	0.20	-30.0%
	Size	0.6%	7.7%	0.08	-38.4%
	Momentum	0.9%	10.3%	0.09	-40.1%
	Credit Spread	0.3%	1.4%	0.18	-5.2%
	High Yield Spread	-0.6%	7.3%	(0.08)	-33.2%
	Term Spread	2.8%	7.3%	0.39	-12.8%
Strategy	Merger Arbitrage*	3.2%	3.5%	0.92	-12.0%
	Convertible Arbitrage**	2.0%	6.4%	0.31	-31.2%
	Carry Trade	7.1%	8.7%	0.82	-26.6%
	Currency Value	5.7%	7.6%	0.76	-9.2%
	Currency Momentum	3.0%	9.4%	0.32	-21.9%
Asset-Class Beta	Risk Premium	Annualized Premium	Annualized Volatility	Sharpe Ratio	Maximum Drawdown
Equity	MSCI EAFE	0.3%	15.9%	0.02	-54.0%
	MSCI Japan	-5.4%	19.4%	(0.28)	-69.0%
	MSCI USA	3.4%	15.5%	0.22	-51.7%
	MSCI Emerging Markets	3.2%	24.6%	0.13	-61.2%
Bonds	Merrill Lynch Domestic Master***	1.7%	3.7%	0.46	-7.6%

- * MSCI HFI Merger Arbitrage before 2003, afterwards a simulated Merger Arbitrage Index
- ** MSCI HFI Convertible Arbitrage before 2003, afterwards a simulated Convertible Arbitrage Index
- *** Merrill Lynch Domestic Master follows the US dollar denominated investment grade Public Corporate and Government debt.

The return/risk profile is an important consideration but understanding the diversification benefit of investing in risk premia is equally important. Exhibit 4 displays the correlations between the style and strategy risk premia. The upper left box shows the correlations between different style indices whereas the lower box to the right displays the correlations between the different strategy indices for the period from May 1995 to the end of October 2008.

Exhibit 4: Correlations of Style and Strategy Risk Premia – May 1995 to October 2008

	Value	Size	Mom	Credit Spread	HY Spread	Term Spread	Merger Arb.	Conv. Arb.	Carry Trade	Curr. Value	Curr. Mom.
Value	1										
Size	0.11	1						< 0.25			
Momentum	-0.47	0.15	1					> 0.50			
Credit Spread	0.07	0.06	0.15	1							
High Yield Spread	0.06	0.26	0.20	0.56	1						
Term Spread	-0.05	-0.02	0.18	0.04	-0.09	1					
Merger Arbitrage	-0.02	0.18	0.33	0.29	0.49	-0.12	1				
Convertible Arbitrage	-0.02	0.18	0.52	0.25	0.39	0.17	0.44	1			
Carry Trade	0.00	0.10	0.35	0.41	0.45	0.08	0.37	0.58	1		
Currency Value	0.10	-0.04	-0.19	0.20	0.20	-0.03	0.00	-0.20	0.32	1	
Currency Momentum	-0.10	-0.20	-0.14	-0.13	-0.26	0.01	-0.20	-0.20	-0.01	-0.05	1

Most of the correlations in Exhibit 4 are below 0.25 and confirm that the risk premia captured unique return characteristics and offered diversification over this period. Note the highly negative correlation of -0.47 between Momentum and Value - two factors that are often deployed in quantitative equity investing. Not surprisingly, the correlation between high yield and credit spread is high at 0.56, suggesting that these two factors are at least partially redundant.

In Exhibit 5, we analyze the historical correlations between the style, strategy, and asset-class indices. Again, many of the correlations are low but a couple of larger correlations (above 0.50) indicate that some of the risk premia capture similar sources of return.

For example, the term spread has a correlation of 91% with the Merrill Lynch Domestic Master Index, indicating little benefit when including both in the investment universe. Other high correlations are observed between the high yield spread and the equity indices. This result is not surprising since high yielding fixed income instruments are expected to perform like equities. The default risk is higher and the return depends more on the performance of the underlying company than the interest rate environment.

Exhibit 5: Correlations with traditional Asset Class Risk Premia

	MSCI EAFE	MSCI Japan	MSCI USA	MSCI EM	ML Domestic Master
Value	-0.14	-0.15	-0.17	-0.12	-0.05
Size	0.05	0.13	-0.17	0.21	-0.04
Momentum	0.35	0.06	0.07	0.12	0.06
Credit Spread	0.46	0.28	0.52	0.44	0.15
High Yield Spread	0.59	0.34	0.59	0.60	-0.23
Term Spread	-0.18	-0.09	-0.14	-0.23	0.91
Merger Arbitrage	0.52	0.34	0.54	0.51	-0.10
Convertible Arbitrage	0.41	0.23	0.32	0.37	0.30
Carry Trade	0.37	0.12	0.38	0.44	0.12
Currency Value	0.00	-0.08	0.17	0.14	-0.07
Currency Momentum	-0.21	-0.22	-0.13	-0.14	-0.03

Our results confirm that the risk premia capture systematic and independent sources of return beyond the traditional asset classes. Thus far, we have reviewed individual risk premia and their risk and return characteristics. We will now consider potential applications for style and strategy indices, combine the risk premia into portfolios, and compare a portfolio of risk premia to a traditional asset allocation.

III. Applications for Risk Premia Indices

In recent years, academics and practitioners have focused on the replication of certain hedge funds strategies through mechanical trading rules. Mitchell and Pulvino (2001) discuss the characteristics of merger arbitrage strategies and describe methods to create merger arbitrage portfolios that can function as benchmarks for active merger arbitrage hedge funds strategies. In a number of published papers, Fung and Hsieh describe ‘asset-based style’ factors that allow the replication of the systematic component of several hedge funds strategies, including convertible arbitrage. Clarke, De Silva, and Murdock (2005) discuss the potential benefits of a factor based asset allocation and report promising results for the replication of global macro hedge funds strategies.

A more refined set of strategy and style betas has several applications beyond the obvious one of cost effective access to desired risk premia. A set of risk premia that explains different sources of investment returns may be used for:

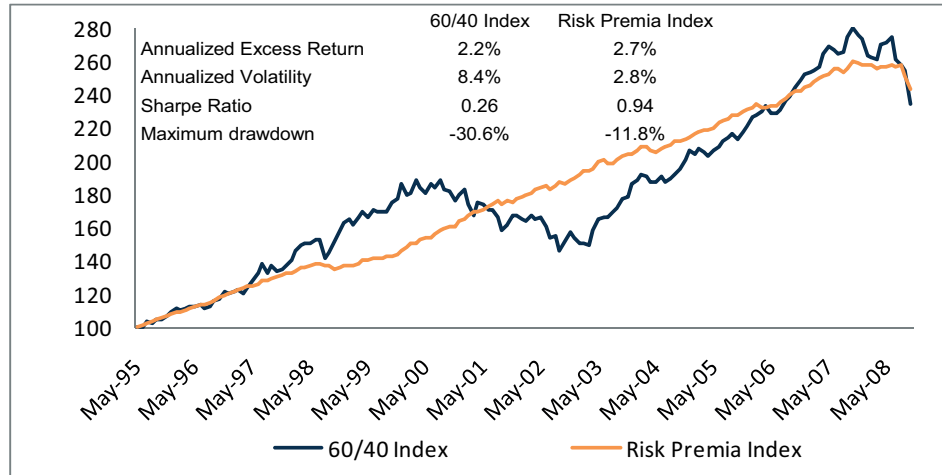
- Asset allocation
- Portfolio construction
- Risk management and stress testing
- Manager selection and performance attribution

We will focus on asset allocation as one important class of decisions where diversification benefits are vital. In our case study, we compare a portfolio characterized by a traditional 60/40 equity/bond mix with a simple equal-weighted mix of the strategy and style indices described in Exhibit 2. The 60/40 portfolio is composed of 60% MSCI World Index and

40% Merrill Lynch Domestic Master Index. We rebalanced both allocations on a monthly basis over the period, May 1995 to end of October 2008. Exhibit 6 shows the cumulative returns of the two allocations and a number of summary statistics.

The annualized excess return above the risk-free rate is comparable: 2.2% for the 60/40 mix versus 2.7% for the equal weighted combination. The much lower realized volatility of only 2.8% (annualized) over this period for the risk premia mix, compared to 8.4% for the 60/40, led to a Sharpe ratio more than 3 times higher for the risk premia index, 0.94 vs. 0.26 respectively.

Exhibit 6: Cumulative Return of traditional and factor based asset allocation



The maximum drawdown highlights the volatility introduced by the 60% equity allocation. During the bear market after the burst of the technology bubble, the 60/40 allocation lost 30.6%, leading to a significant shortfall in many pension plans relative to their liabilities. In contrast, the risk premia combination experienced a 12% maximum drawdown. Similarly, during the recent crisis the 60/40 allocation lost 19.2% between May 2007 and end of October 2008 vs. 11.2% percent for the risk premia combination.

Another important consideration for asset allocation decision making is the performance of the portfolio during extreme events. Exhibit 7 confirms, that the 60/40 allocation experienced greater losses during the months of the Asian crisis in 1997, the LTCM debacle of August 1998, the 9/11 attacks in 2001, and during October 2008. Only during the August 2007 turmoil was the performance of the 60/40 allocation superior.

Exhibit 7: Performance during Extreme Months

Event	Asian Crisis	LTCM	9/11	Quant meltdown	Financial Crisis
Monthly Return in	Oct-97	Aug-98	Sep-01	Aug-07	Oct-08
60/40 Index	-3.0%	-7.8%	-5.0%	0.1%	-8.4%
Risk Premia Index	0.1%	-1.8%	-1.9%	-1.3%	-4.5%
Value	2.3%	-3.4%	-1.0%	-0.6%	0.9%
Size	1.4%	-2.0%	-4.0%	-1.8%	-4.2%
Momentum	0.2%	-2.3%	1.2%	-3.2%	-18.9%
Credit Spread	-0.1%	-1.2%	-0.5%	-0.4%	-1.9%
High Yield Spread	-0.6%	-5.6%	-8.0%	0.1%	-10.4%
Term Spread	2.6%	3.3%	-0.7%	0.9%	-4.1%
Convertible Arbitrage	0.6%	-1.9%	0.5%	-1.4%	-14.4%
Merger Arbitrage	0.3%	-5.0%	-2.2%	0.3%	-3.7%
Carry Trade	-1.5%	-1.9%	-5.1%	-4.6%	-14.6%
Currency Value	-2.2%	-1.7%	-5.2%	2.0%	7.3%
Currency Momentum	-1.8%	2.2%	4.1%	-5.3%	14.1%

Analyzing the performance of the individual style and strategy indices explains the relatively small losses during extreme events; while some risk premia experienced heavily losses, others performed well. October 2008 stands out for the risk premia index with a loss of 4.5% driven by a number of extreme negative returns of more than 10%. These losses were partially offset by the Currency Value and Currency Momentum Indices.

IV. Conclusion and Future Research

The asset allocation case study only scratches the surface of the possibilities for investable risk premia. Being able to invest in independent sources of return across asset classes can have application beyond asset allocation, including portfolio construction, risk management, performance attribution, and manager selection.

Our initial foray into the world of risk premia was not, per se, trying to select the best performing combination for risk premia but more to validate the fact that a combination of such risk premia could provide enough return and diversification benefits as an attractive alternative to traditional asset allocations. Indeed, this approach leads to promising results.

Our future research will focus on three main areas: (1) identifying a comprehensive and independent list of risk premia and finding ways to combine them into efficient portfolios, (2) creating style indices with special attention paid to 'purity' of style and investability, and (3) developing strategy indices that capture the distinct performance patterns of investments with a significant systematic component.

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Appendix A: Simulated Style and Strategy Risk Premia

1. Momentum Style Index:

The simulated momentum equity index consists of the top 1/3rd of the MSCI World Index market capitalization ranked by twelve months performance. The Momentum Style Index reflects the performance of a long position in the simulated momentum index and a short position in the MSCI World Index. The style index is rebalanced semi-annually.

2. Merger Arbitrage Strategy Index:

The simulated Merger Arbitrage Index includes cash-only and cash/stock merger deals. For cash-only deals the index will enter a long position in the target. For deals based on stocks, the index will enter a long position in the target and short the same amount in the acquirer. Borrowing costs and short interest are considered in the performance calculation of the index. The index is rebalanced when mergers are announced and enter the index or when the intended merger either closes, fails, or is stale for at least 6 months.

3. Convertible Arbitrage Strategy Index:

The simulated Convertible Arbitrage Index enters into long positions in convertible bonds and shorts the delta adjusted equivalent amount of the underlying stock. Borrowing costs and short interest are considered in the performance calculation of the index. The index is rebalanced monthly.

4. Carry Trade Strategy Index:

The simulated Currency Carry Trade Strategy Index uses the G10 currencies as the universe (AUD, CAD, CHF, EUR, GBP, JPY, NOK, NZD, SEK, USD). It enters into a long position in the 3 currencies with the highest interest rates combined with a short position in the 3 currencies with the lowest interest rates. The index is rebalanced monthly and shows the performance for a 2:1 leveraged investment of USD 100.

5. Currency Value Strategy Index:

The simulated Currency Value Strategy Index uses the G10 currencies as the universe. It enters into a short position in the 3 currencies that are most overvalued relative to their Purchasing Power Parity (PPP) implied exchange rate combined with a long position in the 3 currencies that are undervalued relative to their PPP implied exchange rate. The index is rebalanced monthly. We used OECD annually-published PPP values to construct the index.

6. Currency Momentum Strategy Index:

The simulated Currency Momentum Strategy Index uses the G10 Currencies as the universe. It enters into a long position in the 3 currencies with the largest spot price increase combined with a short position in the 3 weakest currencies over the previous twelve months. The index is rebalanced monthly and shows the performance for a 2:1 leveraged investment of USD 100.

Emerging Markets: A 20-year Perspective

Remy Briand

Madhusudan Subramanian

“Little else is requisite to carry a state to the highest degree of opulence from the lowest barbarism but peace, easy taxes, and a tolerable administration of justice: all the rest being brought about by the natural course of things.” - Adam Smith

Abstract

In the context of the 20-year anniversary of the MSCI Emerging Markets Index, we review the evolution of equity markets over the last two decades and examine the various drivers of risk and returns for emerging markets. Over this period, strong economic growth combined with the development of financial markets has dramatically increased the opportunity set available to international institutional investors. Early emerging markets investors that identified this growth potential have benefited tremendously from these developments, albeit at the expense of higher volatility. The road to emerging riches has been bumpy, featuring regular and meaningful crises. This prominence of the country factor, which has driven most of common stock volatility in emerging markets, explains the higher volatility compared to developed markets. With that background, we revisit the concept of GDP-weighted indices as an alternative to capture the country factor.

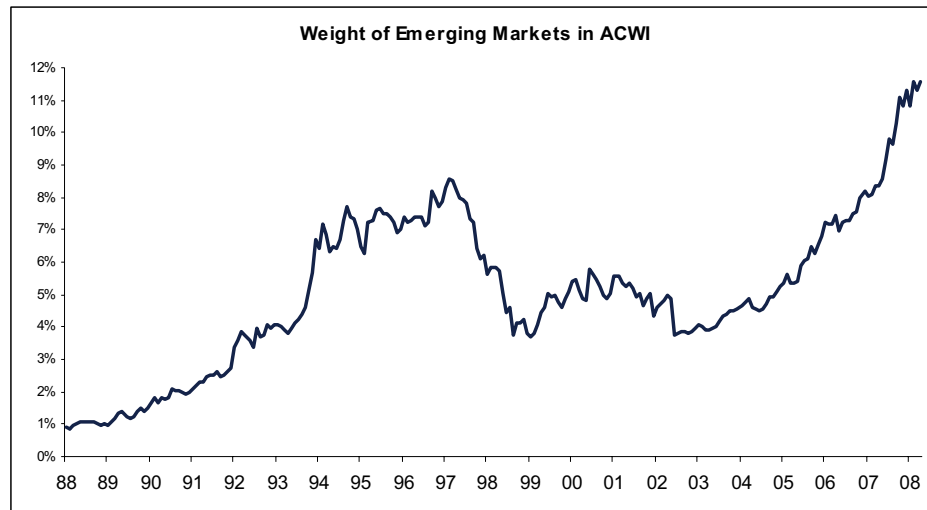
Introduction

In the late eighties, a small group of institutional investors started to look beyond traditional equity markets to invest in emerging markets. These early investors had a very simple yet powerful rationale for investing in these markets. They postulated that they would benefit from rapid economic growth if they invested in markets that were at an early stage of development and had considerable potential for further development. They anticipated that developing countries would progressively adopt market-oriented policies in a globalizing world and that they could invest in companies at low valuation, as these markets were under researched and undiscovered.

Indeed, the last twenty years have seen a continuously expanding universe due to the opening of previously closed markets or markets reaching sufficient size and liquidity to become investable.

For example, since the MSCI Emerging Markets Index was introduced in 1988, the weight of emerging markets in the MSCI All Country World Index (ACWI) has grown from less than 1% to 12% as depicted in Exhibit 1. This has led to a radical change in the opportunity set available to international investors.

Exhibit 1: Weight of Emerging Markets in the MSCI All Country World Index



In the last two decades, several major geopolitical events have triggered the process of adoption of free market reforms resulting in the opening up of many markets. For example, the demise of the Soviet Union, the collapse of apartheid in South Africa, and the adoption of more liberal economic policies in China and India have contributed to the development of freer markets and the emergence of companies with sound businesses.

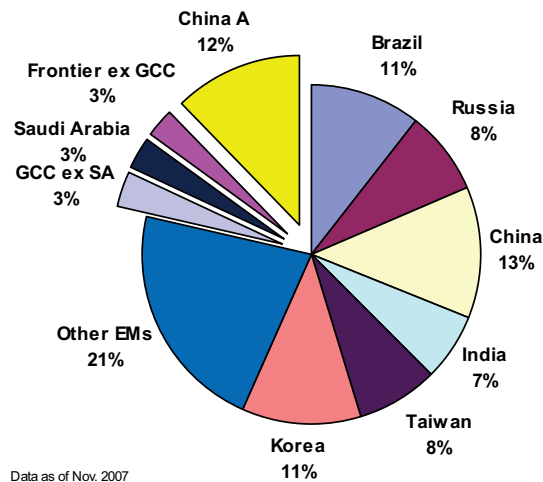
These developments have been recognized by the inclusion of these markets in international equity indices. The timeline in Exhibit 2 illustrates the growth of the opportunity set with new countries being added to the MSCI International Equity Indices every few years. Along the way, some of these countries have become classified as Developed Markets (Greece and Portugal) while others, such as Venezuela, have reversed course and have exited the MSCI International Equity Indices.

Exhibit 2: Historical Timeline of the creation of new MSCI Country Indices

1988	1989	1990	1993	1995	1996	2001	2006	2007	2008
Argentina	Greece	Indonesia	Colombia	China	Russia	Egypt	Bahrain	Bulgaria	Serbia
Brazil	Korea	Turkey	India	Israel	Czech Rep.	Morocco	Kuwait	Croatia	Lithuania
Chile	Portugal		Pakistan	Poland	Hungary		Oman	Estonia	
Jordan	Taiwan		Peru	South Africa			Qatar	Kazakhstan	
Malaysia			Sri Lanka				Saudi Arabia	Romania	
Philippines			Venezuela				U.A.E.	Slovenia	
Thailand								Ukraine	
Mexico								Kenya	
								Mauritius	
								Nigeria	
								Tunisia	
								Lebanon	

The combination of the desire for and achievement of economic growth and the willingness to open the investment opportunities to non-locals to attract capital has led to more markets joining the international investment opportunity set. The latest entrants are markets from countries in the Persian Gulf, the Balkans, and sub-Saharan Africa, among others. On the demand side, investors continue to seek new investment opportunities and show interest in investing in these 'frontier' markets, which are typically smaller, and have fewer and smaller companies that are less liquid. This has led to the creation of the MSCI Frontier Market Indices in 2007.

Exhibit 3: Relative Weights of Markets for Emerging, Frontier and Large Closed Markets



As depicted in Exhibit 3, these new potential investment opportunities are sizeable, representing as much as 20% of the current emerging and frontier markets universe. These new segments can be broken down into closed markets that might potentially open such as Saudi Arabia and the China domestic market (A shares), and frontier markets that are open but still relatively difficult to access. Reinforcing the constantly evolving nature of financial markets, MSCI Barra recently announced that it would reclassify Jordan as Frontier Market and would be consulting on proposals to reclassify Israel and Korea as Developed Markets, and on proposals to reclassify Kuwait, Qatar, and the UAE as Emerging Markets.

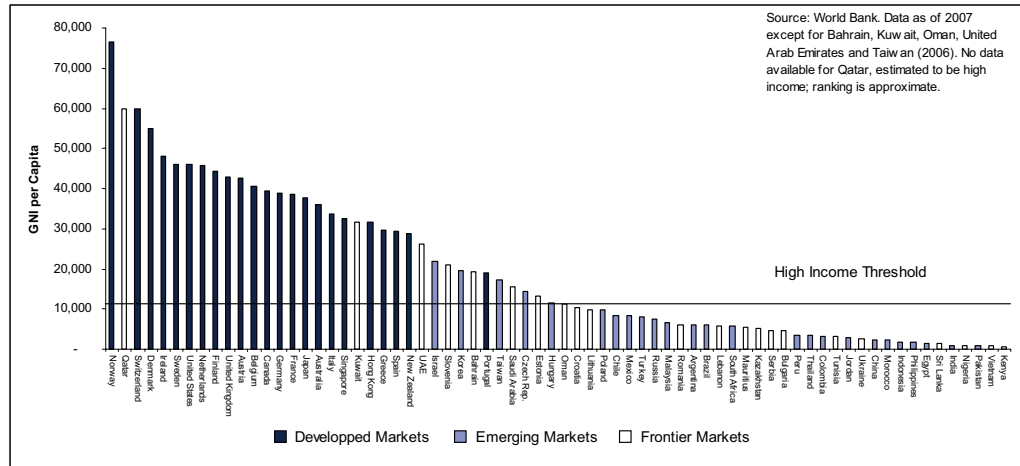
The rest of this paper is organized as follows:

- In the next section, we review the role of economic development in the classification of markets and how economic growth has altered the relative importance of countries over time.
- We then focus on understanding the relationship between the economic size and financial market size of Emerging and Developed Markets.
- The next section analyzes the differences in the risk and return characteristics of Emerging Markets compared to Developed Markets, and highlights the differences in relative importance of factors that drive risk and return in these markets.
- The concluding section explores the use of the existing MSCI GDP-weighted indices as alternatives to capture the country factor by emphasizing economic rather than market size.

I. Economic Development as a Key Driver

Underlying the growth of the investment universe is the economic development of the countries. One marker to identify countries as “developing” – as opposed to “developed” – has been low GDP or GNI per capita. Exhibit 4 depicts the investment universe covering the 70 countries for which MSCI Barra calculates an index ranked by GNI per capita. In this group, thirty-seven countries have a GNI per capita below the World Bank threshold of high/middle income country. These countries represent 15% of world GDP and 80% of the world population.

Exhibit 4: MSCI Country Universe Ranked by GNI Per Capita (Atlas Method, World Bank)



Obviously, economic growth potential does not necessarily translate into realized growth. However, in the aggregate, emerging markets have indeed experienced higher economic growth rates than developed markets. The average economic growth rate has been a full percentage point higher for emerging markets – 5.9% annually over the last 20 years compared to 4.9% for developed markets.

However, the aggregate number alone does not provide the full picture. Growth has not been uniform across all emerging markets. Exhibit 5 highlights the highest and lowest growing countries over the last 20 years as measured by GDP per capita. In 1987, Argentina and Korea had similar GDP per capita at around USD 3,000. At the end of 2007, Korea's GDP per capita was three times that of Argentina.

It is also interesting to note that the divide between high growth and low growth is not exclusively along the lines of emerging and developed countries. Ireland, a developed market country, is in the fastest growing category and four of the five slowest growing countries are emerging markets.

Exhibit 5: Highest and Lowest GDP Per Capita Growth Countries

Per capita Nominal GDP (US Dollars)

Country	1987	1992	1997	2002	2007	CAGR
Highest Growth						
China	294	412	771	1,132	2,460	11.2%
Poland	1,687	2,310	4,064	5,185	10,858	9.8%
Ireland	9,410	15,319	22,223	31,396	58,883	9.6%
Korea	3,366	7,542	11,474	11,504	19,624	9.2%
Chile	1,679	3,283	5,663	4,314	9,698	9.2%
Lowest Growth						
Argentina	3,497	6,845	8,225	2,605	6,310	3.0%
Peru	2,089	1,588	2,455	2,184	3,616	2.8%
Japan	19,884	30,316	33,837	30,809	34,023	2.7%
Jordan	2,317	1,397	1,575	1,880	2,741	0.8%
Egypt	1,508	777	1,263	1,313	1,739	0.7%

Source: IMF

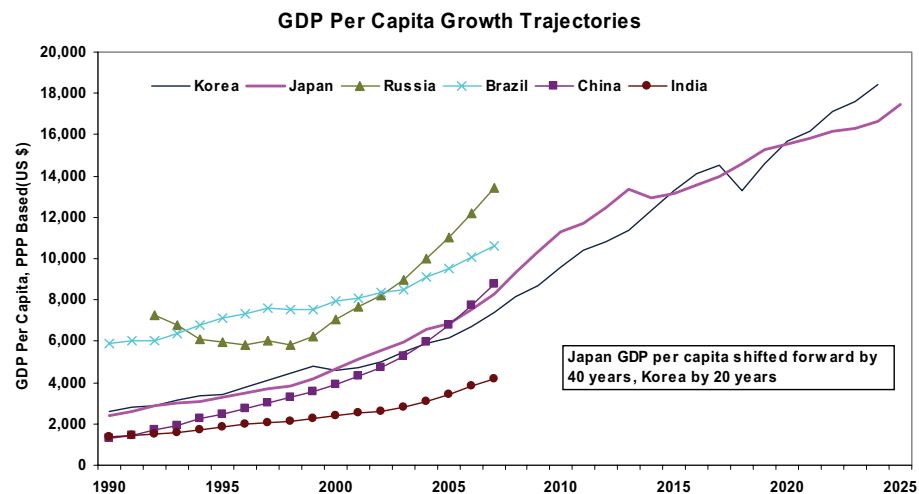
Not only are growth rates not uniform across emerging markets, the growth is subject to violent disruptions. For example, during the 1998 crisis, the weight of emerging markets in the MSCI All Country World Index dropped from 8% to 4%.

II. How do Economies Grow?

It is not clear that there is a beaten path to achieving economic growth. One model that appears to have produced sustainable levels of development is based on manufacturing. Most of the current developed economies of the world grew through industrialization and manufacturing growth. The development of Japan post WWII was based on manufacturing excellence. Korea applied a similar model roughly 20 years later. China's recent growth has been based on the same roadmap. As highlighted by Spence and El Erian [2008], these countries have policies explicitly targeting growth and have built strong political and social consensus around the necessity to support growth. Very often, high levels of investments needed to support this growth are funded by large domestic savings and complemented by select Foreign Direct Investments.

Exhibit 6 shows the growth trajectories of the BRIC countries over the last 15 years along with that of Korea and Japan to illustrate this observation. Japan's GDP per capita series has been moved forward by 40 years and Korea's by 20 years in this chart. It is striking to see how closely Korea has been tracking the time-shifted growth path of Japan and how China may be able to achieve similar or stronger rates of growth.

Exhibit 6: GDP Per Capita Growth Trajectories for Selected Emerging Market and Developed Market Countries



Source: IMF World Outlook, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, Morgan Stanley Research

The development model of the other BRIC countries seems to have different drivers, much more influenced by natural resources in the case of Russia and Brazil, while India is testing its own version of economic development with a strong component of outsourced services. This new dimension of growth in services rather than manufacturing has been made possible by the advent of the internet and the huge reduction in communication costs linked to it. These new models for growth have been untested over long periods but may prove to be other pathways for achieving growth.

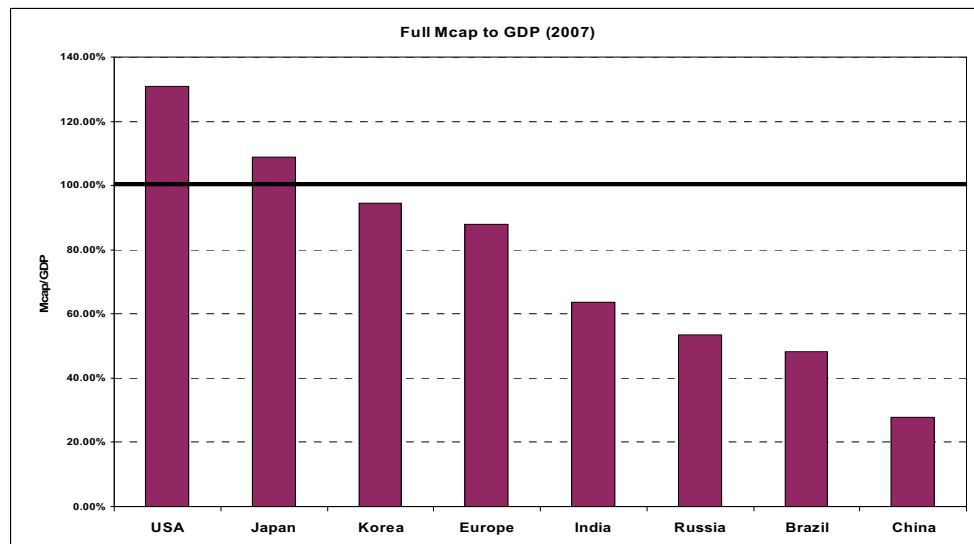
While economic development and models of growth are important elements of the road map for countries to join the international equity opportunity set, those developments can be reversed by other factors such as political disruption. Venezuela has been gradually exiting the international equity opportunity set. In the late 1970s, Iran isolated itself from the free market world, similar to Russia and other countries earlier in the 20th century (although for different reasons).

III. Economic Size vs. Market Size

While economic development and the opening of markets are important drivers of the inclusion of the new markets in the global opportunity set, the proportion of the economy that is reflected in the stock market determines the size of the market. One simple measure that reflects this dimension is the ratio of country market capitalization to GDP. Empirically, as shown in Exhibit 7, advanced financial markets tend to have market capitalization/GDP ratios that are closer to 100%. In contrast, stock markets in China, India, and Russia capture only a small portion of the economy. Over time, market size has typically increased with economic development as families and entrepreneurs float their holdings on the stock market to raise capital, or as state companies are privatized.

Sometimes, the influence of state ownership has resulted in surprising equity market biases. For example, economies in the Persian Gulf region, such as those of Kuwait, UAE or Saudi Arabia, are obviously heavily dependent on energy. However, their stock markets fail to capture this directly, as all energy companies are nationalized.

Exhibit 7: Ratio of Full Market Capitalization to GDP for Select Emerging Markets and Developed Markets Countries



Source: IMF, MSCI Barra. Data as of December 31, 2007.

Overall, we can distinguish a common pattern of a multi stage model of economic and financial development.

Stage 1: Emergence. In this category, countries typically would have low levels of GDP per capita. Their economies are heavily influenced by government or are dominated by family controlled conglomerates that benefit from political connections. The stock market is narrow, composed typically of banks, conglomerates and local utilities, mostly telecommunications. Many of the small countries in the Emerging and Frontier Markets are still at this stage.

Stage 2: Expansion. The economy has specialized along its natural competencies; companies are starting to address markets outside their country of domicile. The export drivers can be natural resource and manufacturing. To finance their expansion, companies need capital, want to diversify their investor base and seek international investors. The stock market starts to broaden and newly listed companies reshape the profile of the market. India, Mexico, Korea, Taiwan currently fit into this category.

At this stage, countries have also improved their legal and regulatory framework and incorporated laws that seek to protect the common interests of domestic and international investors, facilitating access to foreign capital.

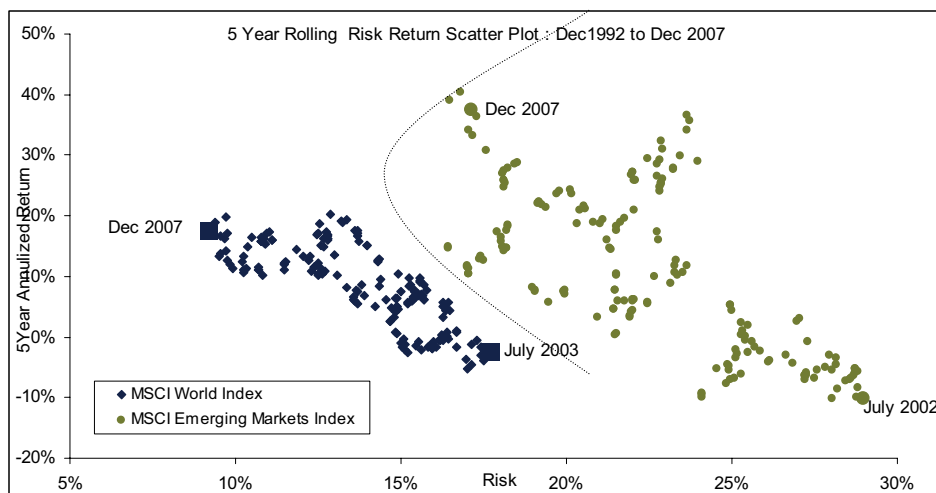
Stage 3: Maturity. The country enjoys high GDP per capita and is completely integrated in the global economy. Global stocks dominate the stock market, which captures more than the domestic economy. The stock markets of Switzerland, dominated by global stocks in the food, pharmaceuticals or banking sectors, or the United Kingdom with its global resources companies and banks are good examples of markets that extend beyond the local economy. Most developed markets are in this category.

IV. Higher Risk for Higher Return

We have thus far examined the differences in economic growth, market openness and their consequences in terms of countries entering the international investment opportunity set. Such distinctions would be moot if they did not translate into different risk and return characteristics. We will therefore now review some of those differences between emerging and developed markets.

When looking at risk and return over rolling 5 year periods in Exhibit 8, it is clear that, collectively, emerging markets have shown a consistent pattern of higher volatility compared to developed markets.

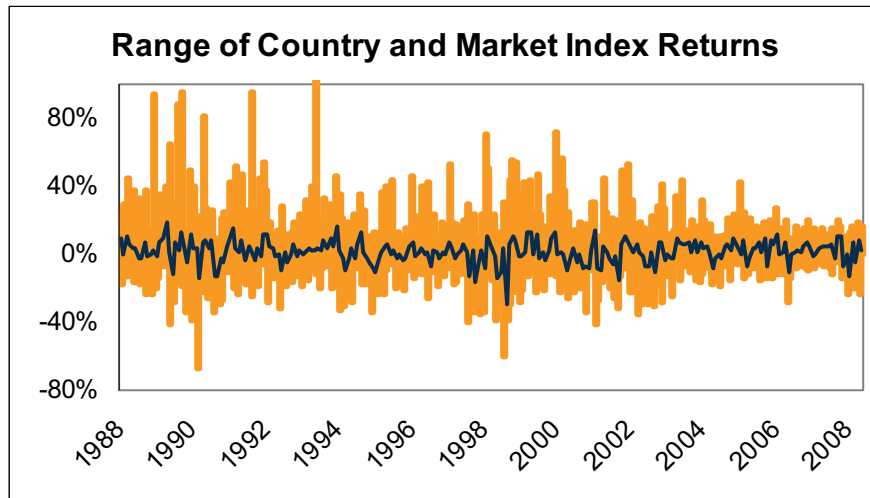
Exhibit 8: Rolling Five Year Risk and Returns for the MSCI World Index and the MSCI Emerging Markets Index for the Period 1992 to 2007



The emergence of developing economies has been punctuated with economic crises, as seen with the Tequila Crisis in 1995, the Asian Crisis in 1997, the Russian Debt Default in 1998 and the Argentina Currency Crisis in 2002. Most of these crises were accompanied by currency devaluations and were often triggered by macroeconomic instabilities coupled with an excessive burden of short-term foreign debt. Even though the trigger of a crisis may be limited to an event within a single country, like in the case of Argentina, it may also spread across its region and impact other emerging and developed markets, as seen in August 1998.

Nevertheless, during the late 1980s and 1990s, returns varied significantly across emerging markets and the monthly return range of the best and worst performing country indices exceeded 80% on a regular basis, as shown in Exhibit 9. Even in August 1998, not all countries went negative; Morocco and Pakistan posted positive monthly returns of 7% and 5%, respectively.

Exhibit 9: Range of MSCI Emerging Country Index Returns and the MSCI Emerging Market Index Return



During the 2000s, the range of index returns has come down, confirming the relative absence of major economic or political crises within Emerging Markets in recent years. Country specific extreme events may have happened less frequently in the recent past but the market as a whole has continued to experience monthly returns above/below +/- 10%.

In addition, average country correlations across emerging markets have increased over the last 20 years from a low of 5% to more than 46% in the most recent 60 month period. The average correlation across the BRIC countries has moved even higher to 55% in the recent period. These results indicate that emerging countries have recently become more interdependent, potentially leading to fewer diversification benefits at the country level.

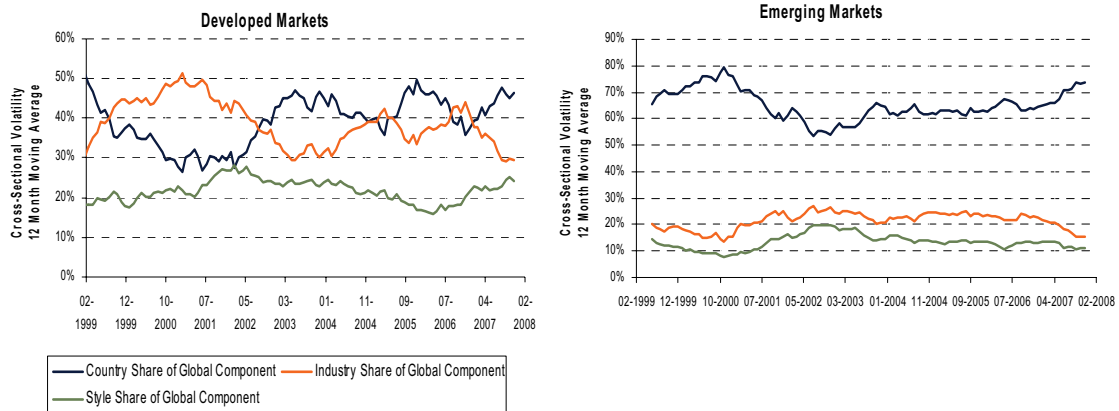
V. Measuring the Country Factor

Most aspects of our analysis so far highlight the importance of the economic and political environment in emerging markets. Is it possible to quantify the relative importance of the country return relative to global sector and style factors? Has there been a trend towards sector diversification and importance within emerging markets similar to developed markets, and in particular Western Europe? Or is the country still the main driver of equity risk and returns?

Due to the pioneering work of Barr Rosenberg in the late 1970s, we know that equity returns are influenced by systematic or fundamental factors. These factors are typically grouped into countries, sectors and styles, such as the market capitalization of a company, the value characteristics or recent price momentum. We can measure the relative importance of these fundamental factors by looking at the cross sectional volatility of stocks across markets through time and by looking at how much of the return dispersion as explained by the fundamental factors comes from country, sector or style factors⁴⁰.

⁴⁰ Cross-sectional volatility ("CSV") measures the dispersion of returns across assets at a single point in time. CSV can be used to gauge the opportunities in a given market to under or outperform relative to the market. It can also be used to understand the overall level of cross-sectional volatility in a particular market as well as the sources of return from which that cross-sectional volatility arises. A factor model, for instance, can allow one to decompose the returns of a set of assets, and therefore the cross-sectional volatility, into various components. Here, we decompose cross-sectional volatility along the lines of the Barra Integrated Model.

Exhibit 10: Relative Importance of Common Factors in Cross Sectional Volatility



Whilst of equal importance to sectors in Developed Markets, the country factor has been a dominant factor in explaining the cross sectional volatility in Emerging Markets, as seen in Exhibit 10.

VI. An Alternative Approach to Capture the Country Factor

The importance of the country factor as a driver of stock returns, and the divergence between economic size and market size of countries that are also potentially the faster growing economies, explains the potential interest for an alternative weighting approach – based on the economic weight of countries rather than market capitalization. Recently there has been increased interest in alternative weighting schemes designed to bias portfolios towards a desired factor. For example, equal weighting is one way to tilt a portfolio towards smaller stocks and capture the size factor. Similarly, fundamental weighting tilts portfolios towards value stocks.

It is, therefore, interesting to look back at one of the first alternative weighting schemes, the GDP-weighted index. MSCI GDP-weighted Indices were introduced in 1988 to address the issue of the large weight of Japan in the MSCI World Index. The GDP weighting scheme was extended to cover Emerging Markets and MSCI ACWI in 2005. GDP-weighted indices use the country's GDP as the weighting factor instead of market capitalization. Consequently, the weights of countries in the GDP-weighted index will represent the relative importance of a country's economy as opposed to the size of its equity market.

Exhibit 11: Largest Absolute Weight Difference Between the Standard Market Capitalization-weighted MSCI ACWI Index and its GDP-weighted equivalent

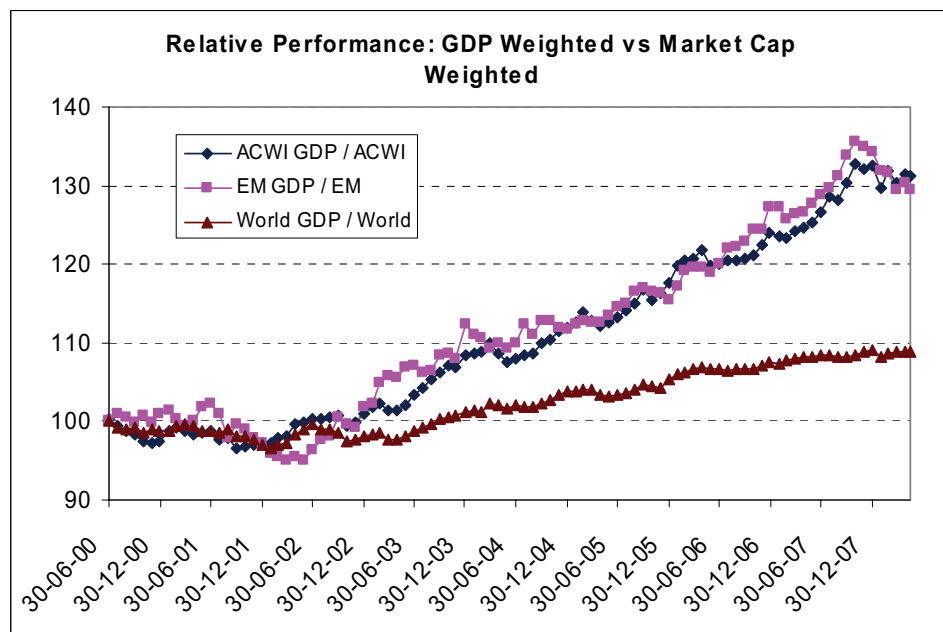
Country	Weight Difference (GDP - Market Cap)
USA	-13.9%
China	4.7%
United Kingdom	-3.5%
Germany	2.8%
Italy	2.6%
Switzerland	-2.1%
India	1.5%
Russia	1.3%
Canada	-1.3%
Mexico	1.2%

Data as of June 2, 2008

As seen in Exhibit 11, the largest current over-weights in the MSCI GDP-weighted ACWI Index are for Emerging Markets, such as China, India and Russia, which are some of the fastest growing economies but have market capitalization weights that are relatively smaller than their economic weights. While the overweight list includes some developed markets, such as Germany and Italy, the countries with the largest disparities in terms of their market capitalization weights being larger than their economic weight are the US and the UK.

These built-in differences in country weights produce an interesting risk return profile, as shown in Exhibit 12. It is striking to see that a simple concept such as GDP-weighting has been so effective at capturing the two major shifts in asset allocation over the last 20 years: underweighting Japan in the 1990s and overweighting Emerging Markets since 2005.

Exhibit 12: Performance of GDP-weighted Indices Relative to their Market Capitalization Weighted Equivalents



There has been little study on why a GDP-weighting scheme may be a more effective way to allocate across countries. As always, one possible explanation is that its apparent effectiveness is purely accidental. Another one is that the GDP weight would serve as a better proxy of the natural country weight – including unlisted equities – in the global portfolio. Another more tactical explanation is that GDP weighting is a way to anticipate other investors' asset allocation decisions, therefore buying before everybody else buys and selling before the others sell.

VII. Conclusion

Our review of 20 years of emerging markets history shows that economic development and market openness play a significant role in the entrance of and growth of markets into the international investment opportunity set. Just as long-term economic growth reshapes the relative importance of nations, rapid and unsustainable economic expansion can also lead to macroeconomic imbalances and create periods of disruption as was seen in the crises in the 1990s. This historical perspective highlights the importance of the country factor in emerging markets investing.

In that context, index providers have also evolved in their role of supporting international investors accessing these markets, by reflecting the expanded opportunity set on a timely basis, by managing the evolution of markets in the context of their country classification as frontier, emerging and developed and also by providing alternative views and tools to capture the country factor such as GDP-weighted indices.

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INDEX REVIEW

Index Developments in 2008	61
MSCI Global Investable Market Indices	62
Performance of MSCI Global, Regional and Country Indices	63–69
Number of Securities and Capitalization by Geography & Size Segment	70
Index Weights of MSCI Country and Regional Indices	71–72
Performance of MSCI Global Investable Market Size Indices	73
Performance of MSCI Global Value & Growth Indices	74–75
Performance of MSCI Global Sector Indices	76–77
MSCI ACWI Regional, Country and Industry Group Index Ratios	78–79
Long Term Valuation, Earnings & Stock Prices	80
Performance and Sector Weights of MSCI Global Islamic Indices	81
Performance of MSCI Thematic & Strategy Indices	82
Performance of Currencies	83
Performance of MSCI US Equity Indices	84

Index Developments in 2008

Country Classification

The following developments related to country classification in MSCI Indices occurred in 2008:

- **Launched Consultations on Proposed Market Classifications:** In July 2008, MSCI Barra launched consultations with the investment community on proposals to reclassify Israel and Korea as Developed Markets and Kuwait, Qatar and United Arab Emirates as Emerging Markets. Preliminary assessments based on the consultations were released on December 16, 2008.
- **Reclassified Jordan from an Emerging Market to a Frontier Market:** In November 2008, MSCI Barra reclassified Jordan from an Emerging Market to a Frontier Market.
- **Removed Pakistan from the MSCI Emerging Markets Index:** MSCI Barra removed Pakistan from MSCI Emerging Markets Index as of the close of December 31, 2008. MSCI Pakistan is currently a stand-alone index.
- **Expanded coverage of Frontier Markets:** In November 2008, Lithuania and Serbia (previously stand-alone indices) were added to the MSCI Frontier Market Index. In addition, Botswana, Ghana, Jamaica and Trinidad & Tobago were introduced as stand-alone Indices and will be considered for inclusion in the MSCI Frontier Markets Index in May 2009.

New Index Launches

MSCI Barra expanded its Family of Thematic and Strategy Indices: MSCI Barra launched the following Thematic and Strategy Indices in 2008:

- MSCI Minimum Volatility Indices
- MSCI Global Currency Indices
- MSCI Equal Weighted Indices
- MSCI Agriculture & Food Chain Indices
- MSCI Commodity Producers Indices
- MSCI Short & Leveraged Indices
- MSCI Infrastructure Indices
- MSCI All Peru Index
- MSCI Tradable APEX Indices for Asia
- MSCI Russia ADR/GDR Index
- MSCI Russia Alternative Listing Index

MSCI Global Investable Market Indices

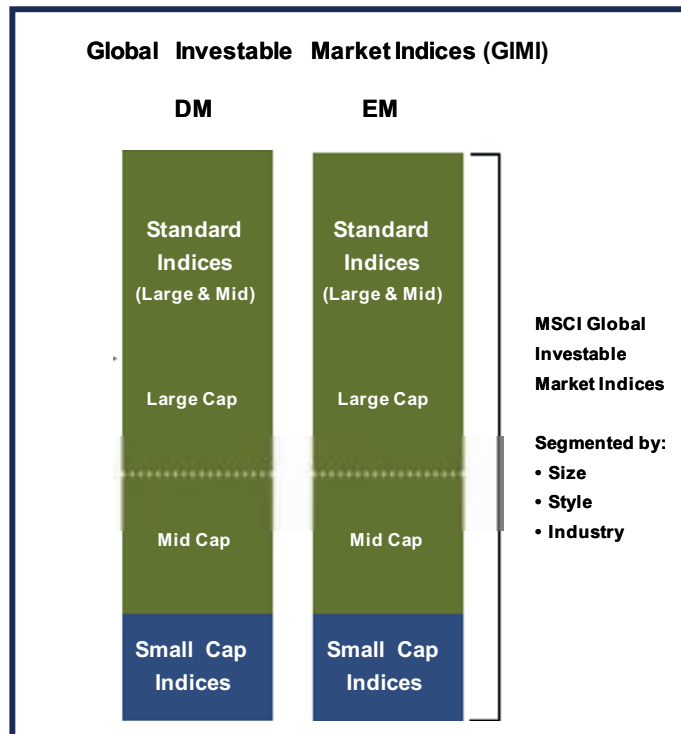
MSCI Index Research

The family of MSCI Equity Indices provides exhaustive coverage of today's equity markets with non-overlapping market capitalization size segmentation.

MSCI Global Standard Indices exhaustively cover all investable large and mid cap securities by including approximately 85% of each market's free float-adjusted market capitalization.

MSCI Global Small Cap Indices cover companies with a market capitalization below that of the companies in the MSCI Global Standard Indices, and target up to 99% coverage of the free-float adjusted market capitalization in each market. Small cap securities in the emerging markets are also represented in a set of MSCI Emerging Markets Small Cap Indices.

The MSCI Global Standard and MSCI Global Small Cap Indices are combined to form the MSCI Global Investable Market Indices, segmented by region/country, size (large, mid and small cap), value/growth styles and GICS® sectors/industries



Performance of MSCI Global, Regional and Country Investable Market Indices

	No. of Countries	Mkt Cap	Index Weight	No. Sec	Gross Perf. in Local			Gross Perf. in USD		
					Annualized 1Y	5Y	5Y Risk Std Dev	Annualized 1Y	5Y	5Y Risk Std Dev
ACWI	47	20,817	100.0%	8,445	-39.4%	0.4%	14.1	-42.0%	0.6%	15.5
WORLD	23	18,847	90.5%	6,026	-38.5%	-0.2%	13.7	-40.5%	0.2%	14.8
WORLD EX JAPAN	22	16,574	79.6%	4,885	-38.0%	0.1%	13.5	-41.8%	0.1%	15.2
EAFE	21	8,601	41.3%	3,265	-40.4%	1.4%	14.8	-43.4%	2.2%	16.7
DM NORTH AMERICA	2	10,246	49.2%	2,761	-36.7%	-1.2%	13.5	-37.8%	-1.2%	13.9
US USA		9,524	45.8%	2,458	-37.0%	-1.6%	13.5	-37.0%	-1.6%	13.5
CA Canada		722	3.5%	303	-33.4%	4.6%	15.5	-46.7%	5.5%	22.4
DM EUROPE	16	5,535	26.6%	1,622	-39.3%	2.2%	14.4	-46.8%	2.1%	17.7
GB United Kingdom		1,680	8.1%	415	-29.5%	3.4%	13.0	-49.1%	-1.0%	16.3
FR France		883	4.2%	180	-40.4%	1.5%	15.2	-43.4%	3.4%	18.6
DE Germany		733	3.5%	166	-42.7%	3.4%	16.8	-45.5%	5.4%	20.8
CH Switzerland		691	3.3%	116	-34.8%	2.4%	13.3	-30.7%	5.5%	14.2
ES Spain		373	1.8%	87	-38.0%	6.7%	16.1	-41.0%	8.8%	20.2
IT Italy		316	1.5%	153	-46.6%	-1.4%	15.6	-49.3%	0.6%	18.9
NL Netherlands		208	1.0%	60	-45.2%	0.0%	17.8	-47.9%	2.0%	21.0
SE Sweden		181	0.9%	98	-39.9%	5.0%	18.9	-50.9%	3.0%	24.0
FI Finland		119	0.6%	47	-52.8%	-0.1%	22.5	-55.1%	1.8%	25.3
DK Denmark		75	0.4%	47	-47.7%	3.5%	19.1	-50.2%	5.5%	22.0
BE Belgium		71	0.3%	51	-62.4%	-6.4%	22.5	-64.3%	-4.5%	25.8
NO Norway		62	0.3%	62	-53.6%	7.8%	26.3	-64.0%	6.7%	31.9
GR Greece		48	0.2%	57	-64.6%	-2.8%	24.1	-66.4%	-0.9%	27.0
AT Austria		35	0.2%	36	-63.2%	-1.4%	25.8	-65.0%	0.6%	28.7
IE Ireland		31	0.1%	24	-67.2%	-13.1%	22.7	-68.9%	-11.4%	24.5
PT Portugal		30	0.1%	23	-47.8%	1.1%	18.3	-50.4%	3.1%	21.1
DM PACIFIC	5	3,066	14.7%	1,643	-42.1%	0.0%	17.0	-36.0%	2.1%	16.8
JP Japan		2,273	10.9%	1,141	-41.6%	-2.2%	18.8	-28.0%	1.1%	16.4
AU Australia		511	2.5%	225	-38.8%	7.2%	14.2	-51.4%	5.5%	22.9
HK Hong Kong		172	0.8%	152	-53.0%	4.0%	21.7	-52.7%	4.0%	21.6
SG Singapore		99	0.5%	103	-49.1%	2.9%	19.9	-49.1%	6.3%	22.2
NZ New Zealand		12	0.1%	22	-34.1%	1.9%	14.2	-50.0%	-0.4%	20.9
EM	24	1,971	9.5%	2,419	-46.3%	8.1%	20.6	-53.6%	7.9%	25.3
EM ASIA	9	1,125	5.4%	1,690	-47.8%	5.6%	21.9	-53.5%	5.7%	25.2
CN China		346	1.7%	280	-51.4%	12.9%	31.3	-51.1%	13.0%	31.3
KR Korea		272	1.3%	352	-40.0%	7.8%	22.7	-55.4%	6.6%	29.5
TW Taiwan		235	1.1%	450	-45.3%	-4.2%	21.7	-46.0%	-3.6%	24.5
IN India		137	0.7%	290	-58.2%	12.2%	29.0	-66.2%	10.7%	32.9
MY Malaysia		63	0.3%	130	-39.9%	4.4%	15.8	-42.6%	6.4%	18.6
ID Indonesia		30	0.1%	53	-51.0%	18.3%	27.5	-57.8%	12.4%	34.5
TH Thailand		29	0.1%	77	-47.8%	-5.1%	24.6	-49.5%	-2.6%	28.0
PH Philippines		10	0.0%	30	-47.2%	7.5%	22.5	-54.2%	10.9%	25.3
PK Pakistan*		3	0.0%	28	-66.1%	-4.0%	33.6	-73.6%	-10.0%	35.3
EM EMEA	9	454	2.2%	456	-48.3%	8.5%	20.5	-55.4%	6.8%	26.7
ZA South Africa		173	0.8%	123	-17.4%	18.4%	16.8	-38.9%	11.0%	28.8
RU Russia		101	0.5%	44	-72.4%	0.6%	35.4	-74.0%	-0.1%	36.1
IL Israel		65	0.3%	79	-33.8%	2.5%	17.5	-32.7%	5.3%	18.9
PL Poland		32	0.2%	65	-48.2%	5.6%	24.0	-57.0%	10.6%	32.4
TR Turkey		30	0.1%	77	-51.5%	8.1%	30.7	-63.2%	6.1%	41.5
CZ Czech Republic		16	0.1%	8	-39.4%	20.1%	22.5	-42.9%	27.2%	27.4
EG Egypt		15	0.1%	36	-51.7%	31.7%	36.6	-51.7%	34.6%	38.3
HU Hungary		11	0.1%	10	-57.2%	3.8%	27.0	-61.3%	5.4%	33.8
MA Morocco		11	0.1%	14	-6.5%	21.6%	20.0	-10.2%	23.6%	22.7
EM LATIN AMERICA	6	392	1.9%	273	-38.4%	15.6%	21.7	-51.8%	16.9%	29.2
BR Brazil		240	1.2%	160	-43.2%	14.4%	25.8	-56.6%	19.4%	35.5
MX Mexico		96	0.5%	50	-28.3%	18.3%	19.6	-43.5%	13.5%	24.2
CL Chile		28	0.1%	32	-19.5%	11.6%	14.8	-37.1%	10.0%	21.3
PE Peru		12	0.1%	9	-39.7%	17.8%	34.8	-41.0%	19.0%	35.3
CO Colombia		12	0.1%	11	-17.3%	30.1%	28.7	-25.8%	35.7%	34.3
AR Argentina		4	0.0%	11	-48.0%	13.3%	36.4	-52.5%	9.6%	38.6

Data as of Dec 31, 2008. Market capitalization numbers are in USD Billions.

* Pakistan was removed from the MSCI Emerging Markets Index as of the close of Dec 31, 2008

This table reflects the performance of the Investable Market Indices within the Global Investable Market Index family and includes back-calculated history.

Performance of MSCI Global, Regional and Country Standard Indices

	No. of Countries	Mkt Cap	Index		Gross Perf. in Local			Gross Perf. in USD		
			Weight	No. Sec	Annualized 1Y	5Y	5Y Risk Std Dev	Annualized 1Y	5Y	5Y Risk Std Dev
ACWI	47	18,479	100.0%	2,439	-39.2%	0.2%	13.8	-41.8%	0.4%	15.2
WORLD	23	16,732	90.5%	1,693	-38.3%	-0.4%	13.4	-40.3%	0.0%	14.5
WORLD EX JAPAN	22	14,772	79.9%	1,339	-37.7%	-0.1%	13.1	-41.6%	-0.1%	14.8
EAFE	21	7,762	42.0%	988	-39.9%	1.4%	14.5	-43.1%	2.1%	16.5
DM NORTH AMERICA	2	8,970	48.5%	704	-36.6%	-1.6%	13.1	-37.8%	-1.6%	13.4
US		8,322	45.0%	607	-37.1%	-2.1%	13.1	-37.1%	-2.1%	13.0
CA		647	3.5%	97	-31.4%	5.0%	15.1	-45.2%	6.0%	22.0
DM EUROPE	16	5,093	27.6%	494	-38.5%	2.1%	14.0	-46.1%	2.0%	17.3
GB		1,543	8.3%	115	-28.5%	3.2%	12.7	-48.3%	-1.2%	16.0
FR		846	4.6%	76	-39.7%	1.1%	14.9	-42.7%	3.1%	18.4
DE		679	3.7%	51	-42.7%	3.5%	16.7	-45.5%	5.5%	20.6
CH		652	3.5%	38	-34.1%	2.1%	13.1	-29.9%	5.2%	13.9
ES		352	1.9%	31	-37.0%	6.7%	16.3	-40.1%	8.8%	20.3
IT		285	1.5%	39	-46.6%	-1.8%	15.3	-49.2%	0.2%	18.8
NL		189	1.0%	20	-45.2%	-0.2%	17.8	-47.9%	1.7%	20.9
SE		156	0.8%	31	-37.8%	4.6%	18.8	-49.2%	2.6%	23.8
FI		108	0.6%	17	-52.3%	0.4%	23.4	-54.7%	2.4%	25.9
DK		65	0.4%	15	-44.7%	6.8%	18.0	-47.3%	8.9%	21.4
BE		58	0.3%	14	-64.4%	-7.9%	23.4	-66.1%	-6.1%	26.8
NO		48	0.3%	10	-53.5%	7.4%	26.7	-63.9%	6.3%	32.6
GR		37	0.2%	11	-64.2%	-1.3%	24.3	-66.0%	0.7%	27.0
AT		25	0.1%	9	-66.6%	-2.6%	27.0	-68.2%	-0.7%	29.9
PT		26	0.1%	10	-49.3%	0.2%	18.2	-51.8%	2.1%	21.1
IE		24	0.1%	7	-70.3%	-15.7%	23.7	-71.7%	-14.0%	25.2
DM PACIFIC	5	2,669	14.4%	495	-42.2%	0.1%	17.1	-36.2%	2.2%	16.8
JP		1,960	10.6%	348	-42.5%	-2.3%	19.0	-29.1%	1.0%	16.6
AU		462	2.5%	72	-37.0%	7.6%	13.8	-50.0%	5.9%	22.5
HK		156	0.8%	43	-51.5%	4.0%	21.2	-51.2%	4.0%	21.4
SG		84	0.5%	27	-47.3%	3.3%	19.3	-47.3%	6.8%	21.7
NZ		7	0.0%	5	-38.6%	-0.8%	15.4	-53.4%	-3.1%	22.0
EM	24	1,747	9.5%	746	-45.7%	8.1%	20.6	-53.2%	8.0%	25.2
EM ASIA	9	973	5.3%	458	-47.1%	5.5%	21.6	-52.8%	5.5%	24.9
CN		318	1.7%	98	-51.1%	12.7%	32.0	-50.8%	12.8%	31.7
KR		238	1.3%	95	-39.5%	6.7%	22.0	-55.1%	5.5%	29.1
TW		190	1.0%	100	-45.2%	-4.1%	20.8	-45.9%	-3.4%	23.6
IN		114	0.6%	59	-56.3%	10.1%	28.7	-64.6%	8.7%	32.2
MY		53	0.3%	42	-38.5%	4.8%	15.5	-41.2%	6.8%	18.4
ID		26	0.1%	19	-49.2%	22.0%	27.8	-56.2%	15.9%	34.6
TH		24	0.1%	24	-46.6%	-4.3%	27.5	-48.3%	-1.7%	27.6
PH		9	0.0%	13	-44.6%	7.9%	22.5	-51.9%	11.3%	24.9
PK		2	0.0%	8	-66.7%	0.0%	35.0	-74.0%	-6.3%	36.8
EM EMEA	9	407	2.2%	163	-48.6%	8.1%	20.9	-55.6%	6.5%	26.9
ZA		147	0.8%	43	-16.0%	17.9%	17.5	-37.9%	10.5%	29.2
RU		99	0.5%	26	-72.2%	-0.6%	35.2	-73.8%	-1.3%	36.0
IL		59	0.3%	21	-30.0%	4.9%	17.5	-28.8%	7.8%	18.8
PL		28	0.2%	21	-45.2%	5.4%	24.2	-54.5%	10.4%	32.6
TR		26	0.1%	24	-50.1%	8.6%	33.1	-62.1%	6.6%	42.1
CZ		16	0.1%	6	-39.2%	19.9%	22.5	-42.7%	26.9%	27.4
EG		12	0.1%	12	-52.4%	36.2%	37.8	-52.4%	39.2%	39.8
HU		11	0.1%	4	-57.4%	4.8%	27.3	-61.5%	6.5%	34.4
MA		9	0.0%	6	-7.2%	23.4%	20.6	-10.9%	25.5%	23.4
EM LATIN AMERICA	6	367	2.0%	125	-37.7%	16.2%	21.9	-51.3%	17.2%	29.2
BR		226	1.2%	69	-42.4%	14.8%	26.7	-56.1%	19.8%	35.8
MX		91	0.5%	25	-27.6%	19.8%	19.5	-42.9%	14.9%	24.2
CL		24	0.1%	16	-17.3%	11.8%	14.5	-35.4%	10.2%	21.3
PE		12	0.1%	4	-38.9%	20.3%	35.0	-40.1%	21.4%	35.7
CO		11	0.1%	7	-16.5%	30.8%	29.6	-25.1%	36.5%	35.2
AR		2	0.0%	4	-50.1%	12.2%	38.1	-54.4%	8.6%	39.9

Data as of Dec 31, 2008. Market capitalization numbers are in USD Billions.

* Pakistan was removed from the MSCI Emerging Markets Index as of the close of Dec 31, 2008

Performance of MSCI Global, Regional and Country Standard Indices (Continued)

- Frontier Markets fared as badly as Emerging Markets in 2008, down by 54% in USD terms compared to -53.2% for the MSCI Emerging Markets Index and -40.3% for the MSCI World Index.

	No. of Countries	Mkt Cap	Weight	No. Sec	Gross Perf. in Local			Gross Perf. in USD		
					Annualized 1Y	5Y	5Y Risk Std Dev	Annualized 1Y	5Y	5Y Risk Std Dev
FM	22	89	100.0%	180	-52.4%	4.1%	22.6	-54.1%	4.7%	23.3
FM EX GCC	17	33	37.3%	103	-52.0%	7.8%	19.0	-56.4%	8.0%	20.8
FM EMEA	20*	87	98.0%	170	-52.3%	4.2%	22.7	-54.1%	4.9%	23.4
FM CENTRAL & EASTERN EUROPE & CIS	9	11	12.3%	39	-61.2%	3.3%	21.3	-63.8%	3.2%	24.4
Kazakhstan		4	4.0%	4	-57.7%	NA	NA	-57.8%	NA	NA
Slovenia		3	3.2%	7	-63.5%	4.8%	24.0	-65.3%	6.6%	26.2
Croatia		2	2.7%	11	-58.5%	-0.3%	30.4	-60.8%	2.4%	32.8
Romania		1	1.3%	5	-60.3%	NA	NA	-66.4%	NA	NA
Estonia		0	0.4%	2	-62.0%	-4.5%	30.8	-63.8%	-2.7%	33.3
Lithuania**		0	0.2%	2	-43.5%	NA	NA	-49.5%	NA	NA
Serbia**		0	0.2%	2	-67.2%	NA	NA	-73.0%	NA	NA
Ukraine		0	0.2%	4	-75.4%	NA	NA	-83.9%	NA	NA
Bulgaria		0	0.1%	2	-80.8%	NA	NA	-81.7%	NA	NA
FM AFRICA	4	15	16.5%	32	-45.6%	12.6%	25.1	-53.5%	12.3%	26.7
Kenya		3	2.9%	8	-23.0%	7.7%	23.6	-37.2%	7.1%	28.6
Mauritius		1	0.9%	3	-36.3%	29.4%	20.8	-43.5%	24.5%	24.0
Nigeria		10	11.7%	17	-49.8%	13.8%	30.8	-57.7%	13.8%	32.7
Tunisia		1	0.9%	4	1.3%	NA	NA	-5.7%	NA	NA
Bahrain @		2	2.4%	8	-53.1%	-70.4%	26.6	-53.1%	-70.7%	26.6
Kuwait @		32	35.6%	28	-45.6%	-76.1%	23.3	-46.2%	-74.6%	23.6
Oman @		3	3.7%	11	-45.2%	-79.3%	26.3	-45.2%	-79.3%	26.3
Qatar @		8	9.5%	13	-26.3%	-70.6%	49.2	-26.3%	-70.6%	49.2
UAE @		10	11.6%	17	-72.7%	-65.9%	54.2	-72.7%	-65.9%	54.2
Lebanon		2	2.7%	6	-19.8%	24.8%	43.2	-19.8%	24.8%	43.6
Jordan ***		3	3.8%	16	-34.7%	9.5%	27.6	-34.7%	9.5%	27.8
FM ASIA	-	-	-	-	-	-	-	-	-	-
Sri Lanka		0	0.3%	2	-57.7%	-2.3%	27.5	-59.4%	-5.3%	27.7
Vietnam		2	1.7%	8	-53.1%	NA	NA	-57.1%	NA	NA

Data as of Dec 31, 2008. Market capitalization numbers are in USD Billions.

* The FM EMEA Composite includes FM Central & Eastern Europe & CIS and FM Africa.

** Lithuania and Serbia have historical data starting from May 30, 2008. Therefore, 1 Year returns have been calculated from November 25, 2008 and are not annualized.

***Jordan was added to the MSCI Frontier Markets Index as of the close of November 30, 2008.

@ 5 Year Returns are based on back calculated history.

	No. of Countries	Mkt Cap	Weight	No. Sec	Gross Perf. in Local			Gross Perf. in USD		
					Annualized 1Y	5Y	5Y Risk Std Dev	Annualized 1Y	5Y	5Y Risk Std Dev
STAND ALONE INDICES										
Saudia Arabia & Trinidad & Tobago #		65	-	34	-54.5%	-80.3%	38.6	-54.5%	-80.3%	38.5
Ghana #		2	-	2	-2.2%	NA	NA	-2.6%	NA	NA
Botswana #		2	-	2	NA	NA	NA	-5.5%	NA	NA
Jamaica #		0	-	2	-20.7%	NA	NA	-16.7%	NA	NA
China A		0	-	3	7.1%	NA	NA	3.2%	NA	NA
China A		322	-	313	-64.3%	-8.3%	36.4	-61.8%	0.0%	36.4

Data as of Dec 31, 2008. Market capitalization numbers are in USD Billions.

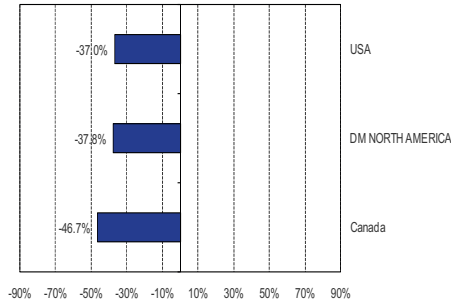
5 Year Returns are based on back calculated history.

Trinidad & Tobago, Ghana, Botswana and Jamaica have historical data starting from November 25, 2008. Therefore, 1 Year returns have been calculated from November 25, 2008 and are not annualized.

2008 Regional Performance of MSCI Global Investable Market Indices

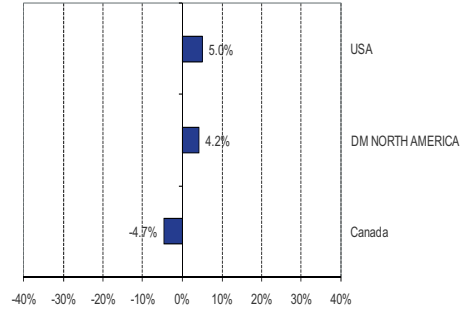
Return (USD)

North America IMI



Excess Return vs. ACWI IMI

North America IMI - ACWI IMI

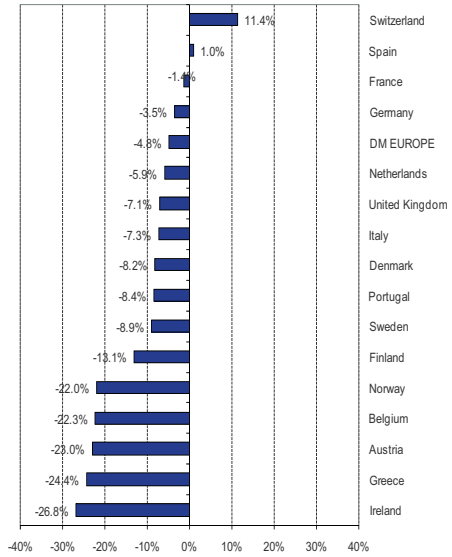


- These charts are a graphical representation of data derived from the MSCI Global Investable Market Indices. They show that, within Developed Markets, all countries posted negative returns in 2008 in USD terms.

Europe IMI

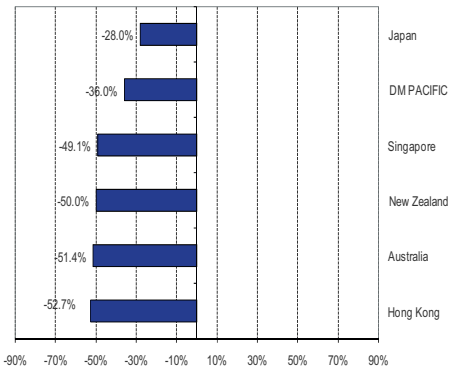


Europe IMI - ACWI IMI

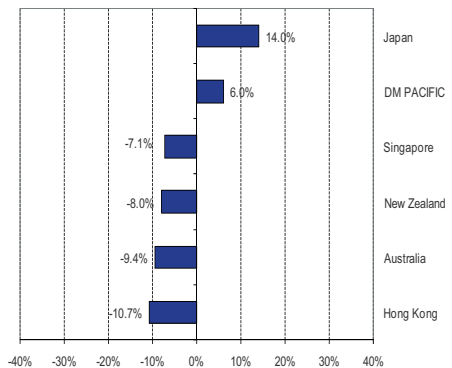


- Only the MSCI USA, MSCI Switzerland, MSCI Spain, and MSCI Japan Indices outperformed the MSCI ACWI IMI in USD terms in 2008.

Pacific IMI



Pacific IMI - ACWI IMI

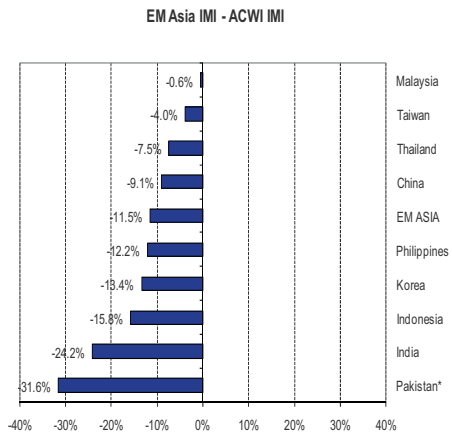
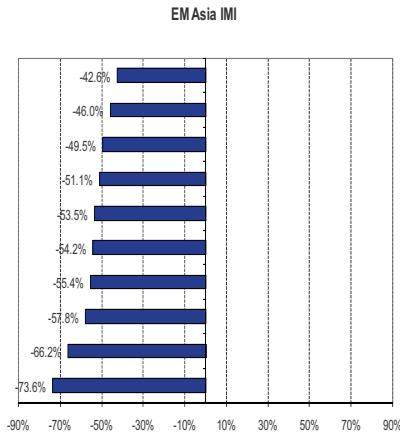


2008 Regional Performance of MSCI Global Investable Market Indices (Continued)

Return (USD)

Excess Return vs. ACWI IMI

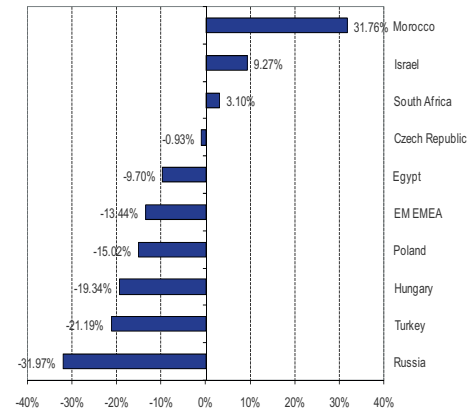
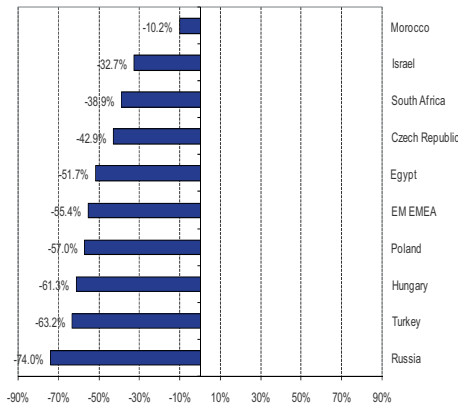
- In Emerging Markets also all countries posted negative returns in 2008.
- Only MSCI Morocco, MSCI Israel, and MSCI South Africa Indices in EMEA, and MSCI Colombia, MSCI Chile, and MSCI Peru Indices in Latin America outperformed the MSCI ACWI IMI.



*Pakistan was removed from the MSCI Emerging Markets Index as of the close of Dec 31, 2008.

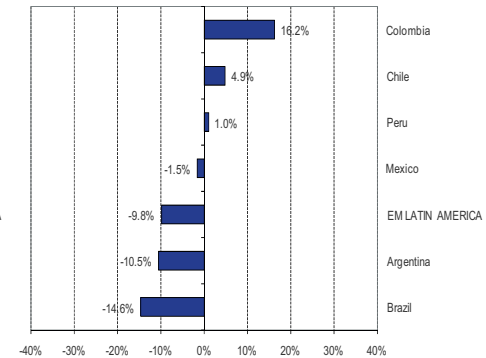
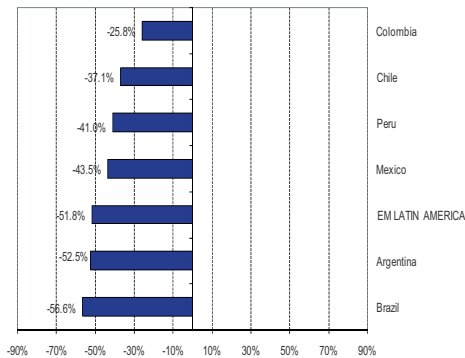
EM EMEA IMI

EM EMEA IMI - ACWI IMI



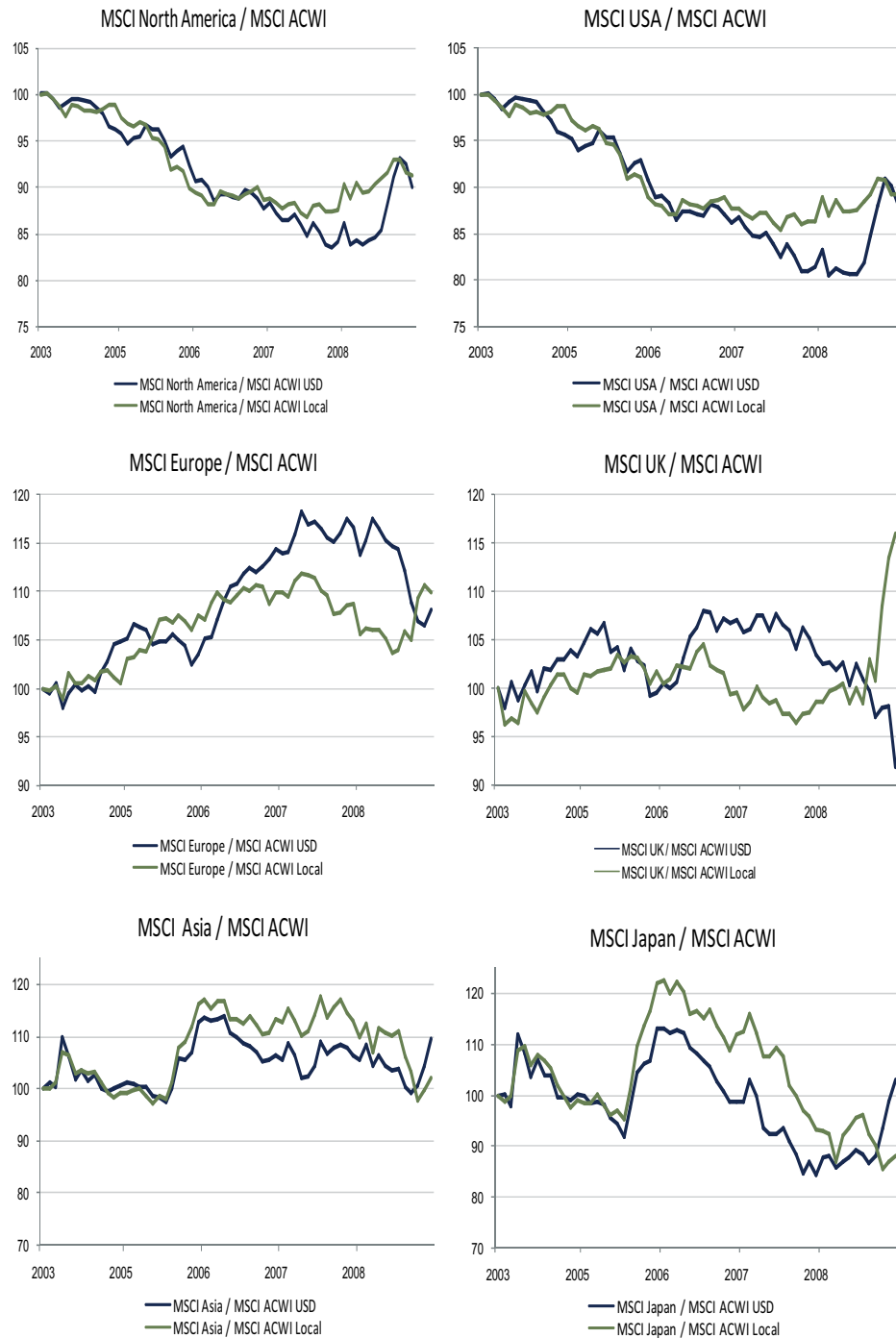
EM Latin America IMI

EM Latin America IMI - ACWI IMI



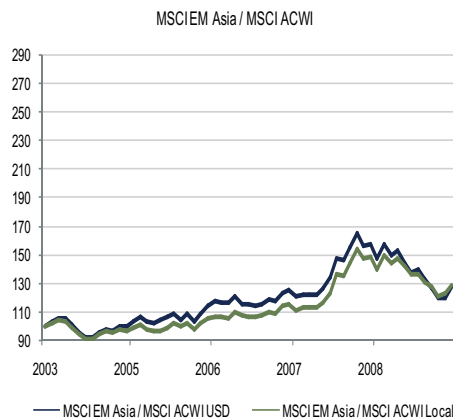
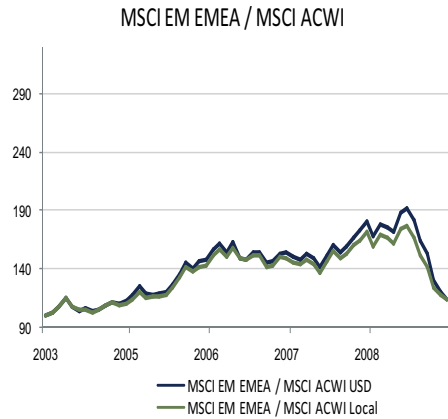
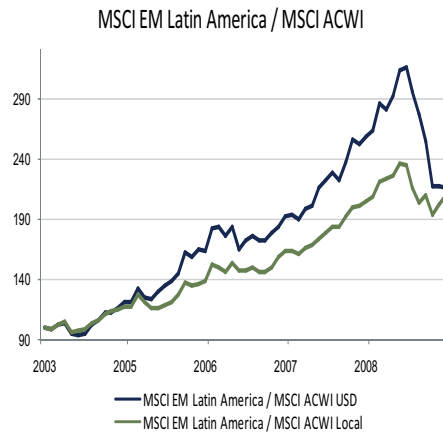
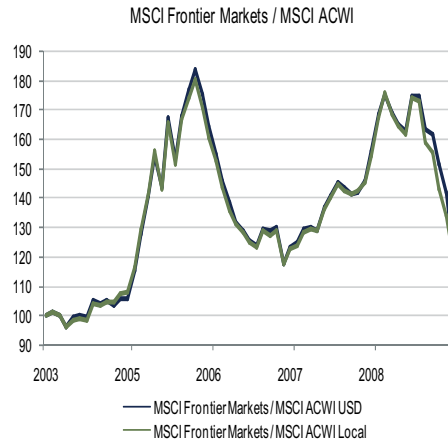
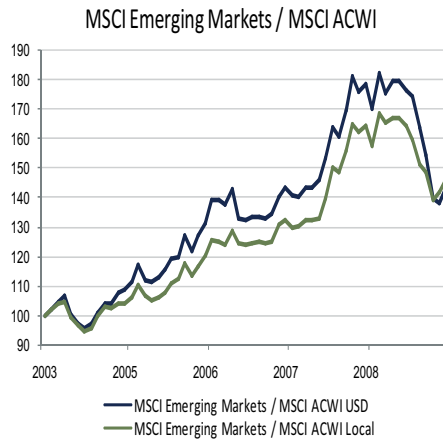
2008 Regional and Major Country Relative Performance of MSCI Global Standard Indices

- In 2008, the MSCI North America Index began to outperform MSCI ACWI after underperforming in the prior years.
- The reverse was true for the MSCI Europe Index, whose performance in USD terms was also affected by currency.
- The MSCI Asia Index has generally kept pace with the MSCI ACWI.



2008 Regional and Major Country Relative Performance of MSCI Global Standard Indices (Continued)

- In 2008, both Emerging Markets and Frontier Markets showed homogenous trends by underperforming the MSCI ACWI in both local currency and USD terms.



Number of Securities and Capitalization by Geography and Size Segment of MSCI Global Investable Market Indices in USD

	Number of Securities					Index Capitalization				
	Large Cap	Mid Cap	Standard	Small Cap	IMI	Large Cap	Mid Cap	Standard	Small Cap	IMI
ACWI	1,157	1,282	2,439	6,006	8,445	15,763	2,715	18,479	2,339	20,817
WORLD	760	933	1,693	4,333	6,026	14,275	2,456	16,732	2,115	18,847
WORLD EX JAPAN	609	736	1,345	3,540	4,885	12,703	2,068	14,772	1,802	16,574
EAFE	436	553	989	2,276	3,265	6,547	1,215	7,762	839	8,601
DM NORTH AMERICA	324	380	704	2,057	2,761	7,728	1,242	8,970	1,276	10,246
US USA	281	326	607	1,851	2,458	7,189	1,133	8,322	1,202	9,524
CA Canada	43	54	97	206	303	538	109	647	74	722
DM EUROPE	218	276	494	1,128	1,622	4,390	703	5,093	442	5,535
GB United Kingdom	46	69	115	300	415	1,340	203	1,543	137	1,680
FR France	38	38	76	104	180	744	102	846	37	883
DE Germany	33	18	51	115	166	635	44	679	54	733
CH Switzerland	16	22	38	78	116	591	62	652	38	691
ES Spain	13	18	31	56	87	306	46	352	20	373
IT Italy	18	21	39	114	153	246	38	285	31	316
NL Netherlands	10	10	20	40	60	160	29	189	19	208
SE Sweden	13	18	31	67	98	112	45	156	25	181
FI Finland	3	14	17	30	47	76	32	108	11	119
DK Denmark	6	9	15	32	47	49	17	65	9	75
BE Belgium	5	9	14	37	51	31	27	58	12	71
NO Norway	5	5	10	52	62	39	9	48	15	62
GR Greece	4	7	11	46	57	20	18	37	10	48
AT Austria	3	6	9	27	36	12	13	25	11	35
IE Ireland	1	6	7	17	24	13	10	24	7	31
PT Portugal	4	6	10	13	23	17	9	26	4	30
DM PACIFIC	218	277	495	1,148	1,643	2,158	512	2,669	397	3,066
JP Japan	151	197	348	793	1,141	1,572	388	1,960	313	2,273
AU Australia	33	39	72	153	225	388	75	462	49	511
HK Hong Kong	22	21	43	109	152	130	26	156	16	172
SG Singapore	12	15	27	76	103	68	16	84	15	99
NZ New Zealand	0	5	5	17	22	0	7	16	9	12
EM	397	349	746	1,673	2,419	1,488	259	1,747	224	1,971
EM ASIA	233	225	458	1,232	1,690	817	156	973	151	1,125
CN China	56	42	98	182	280	278	40	318	28	346
KR Korea	46	49	95	257	352	194	44	238	34	272
TW Taiwan	40	60	100	350	450	158	32	190	45	235
IN India	34	25	59	231	290	96	18	114	23	137
MY Malaysia	22	20	42	88	130	42	11	53	10	63
ID Indonesia	11	8	19	34	53	22	4	26	4	30
TH Thailand	13	11	24	53	77	19	5	24	5	29
PH Philippines	7	6	13	17	30	7	2	9	1	10
PK Pakistan *	4	4	8	20	28	1	1	2	1	3
EM EMEA	94	69	163	293	456	353	54	407	47	454
ZA South Africa	21	22	43	80	123	117	29	147	26	173
RU Russia	22	4	26	18	44	97	2	99	1	101
IL Israel	8	13	21	58	79	53	7	59	5	65
PL Poland	11	10	21	44	65	24	5	28	4	32
TR Turkey	14	10	24	53	77	23	3	26	4	30
CZ Czech Republic	3	3	6	2	8	13	2	16	0	16
EG Egypt	7	5	12	24	36	9	3	12	3	15
HU Hungary	2	2	4	6	10	7	3	11	1	11
MA Morocco	6	0	6	8	14	9	0	9	2	11
EM LATIN AMERICA	70	55	125	148	273	318	48	367	25	392
BR Brazil	36	33	69	91	160	200	26	226	14	240
MX Mexico	15	10	25	25	50	81	10	91	5	96
CL Chile	11	5	16	16	32	20	4	24	3	28
PE Peru	2	2	4	5	9	7	4	12	0	12
CO Colombia	5	2	7	4	11	9	2	11	1	12
AR Argentina	1	3	4	7	11	1	2	2	1	4

Data as of Dec 31, 2008. Market capitalization numbers are in USD Billions.

* Pakistan was removed from the MSCI Emerging Markets Index as of the close of Dec 31, 2008

Index Weights of MSCI Country and Regional Global Investable Market Indices

	Weights in ACWI					Weights in Country Index				
	Large Cap	Mid Cap	Standard	Small Cap	IMI	Large Cap	Mid Cap	Standard	Small Cap	IMI
ACWI	100.0%	100.0%	100.0%	100.0%	100.0%	75.7%	13.0%	88.8%	11.2%	100.0%
WORLD	90.6%	90.5%	90.5%	90.4%	90.5%	75.7%	13.0%	88.8%	11.2%	100.0%
WORLD EX JAPAN	80.6%	85.7%	81.3%	66.0%	79.6%	76.6%	14.0%	90.7%	9.3%	100.0%
EAFE	41.5%	44.7%	42.0%	35.9%	41.3%	76.1%	14.1%	90.2%	9.8%	100.0%
DM NORTH AMERICA	49.0%	45.7%	48.5%	54.6%	49.2%	75.4%	12.1%	87.5%	12.5%	100.0%
US USA	45.6%	41.7%	45.0%	51.4%	45.8%	75.5%	11.9%	87.4%	12.6%	100.0%
CA Canada	3.4%	4.0%	3.5%	3.2%	3.5%	74.6%	15.1%	89.7%	10.3%	100.0%
DM EUROPE	27.8%	25.9%	27.6%	18.9%	26.6%	79.3%	12.7%	92.0%	8.0%	100.0%
GB United Kingdom	8.5%	7.5%	8.3%	5.9%	8.1%	79.8%	12.1%	91.8%	8.2%	100.0%
FR France	4.7%	3.8%	4.6%	1.6%	4.2%	84.3%	11.5%	95.8%	4.2%	100.0%
DE Germany	4.0%	1.6%	3.7%	2.3%	3.5%	86.6%	6.0%	92.6%	7.4%	100.0%
CH Switzerland	3.7%	2.3%	3.5%	1.6%	3.3%	85.5%	9.0%	94.4%	5.6%	100.0%
ES Spain	1.9%	1.7%	1.9%	0.9%	1.8%	82.2%	12.3%	94.5%	5.5%	100.0%
IT Italy	1.6%	1.4%	1.5%	1.3%	1.5%	78.0%	12.1%	90.1%	9.9%	100.0%
NL Netherlands	1.0%	1.1%	1.0%	0.8%	1.0%	77.0%	14.0%	90.9%	9.1%	100.0%
SE Sweden	0.7%	1.6%	0.8%	1.1%	0.9%	61.7%	24.6%	86.3%	13.7%	100.0%
FI Finland	0.5%	1.2%	0.6%	0.5%	0.6%	63.5%	26.9%	90.5%	9.5%	100.0%
DK Denmark	0.3%	0.6%	0.4%	0.4%	0.4%	64.9%	22.5%	87.5%	12.5%	100.0%
BE Belgium	0.2%	1.0%	0.3%	0.5%	0.3%	43.8%	38.6%	82.4%	17.6%	100.0%
NO Norway	0.2%	0.3%	0.3%	0.6%	0.3%	62.0%	14.2%	76.2%	23.8%	100.0%
GR Greece	0.1%	0.7%	0.2%	0.4%	0.2%	41.3%	37.3%	78.5%	21.5%	100.0%
AT Austria	0.1%	0.5%	0.1%	0.5%	0.2%	34.3%	35.9%	70.1%	29.9%	100.0%
IE Ireland	0.1%	0.4%	0.1%	0.3%	0.1%	42.8%	33.3%	76.1%	23.9%	100.0%
PT Portugal	0.1%	0.3%	0.1%	0.2%	0.1%	55.9%	31.2%	87.1%	12.9%	100.0%
DM PACIFIC	13.7%	18.8%	14.4%	17.0%	14.7%	70.4%	16.7%	87.1%	12.9%	100.0%
JP Japan	10.0%	14.3%	10.6%	13.4%	10.9%	69.2%	17.1%	86.2%	13.8%	100.0%
AU Australia	2.5%	2.8%	2.5%	2.1%	2.5%	75.8%	14.7%	90.5%	9.5%	100.0%
HK Hong Kong	0.8%	0.9%	0.8%	0.7%	0.8%	75.9%	14.9%	90.8%	9.2%	100.0%
SG Singapore	0.4%	0.6%	0.5%	0.6%	0.5%	68.7%	16.3%	84.9%	15.1%	100.0%
NZ New Zealand	0.0%	0.3%	0.0%	0.2%	0.1%	0.0%	60.0%	60.0%	40.0%	100.0%
EM	9.4%	9.5%	9.5%	9.6%	9.5%	75.5%	13.1%	88.7%	11.3%	100.0%
EM ASIA	5.2%	5.8%	5.3%	6.5%	5.4%	72.6%	13.9%	86.5%	13.5%	100.0%
CN China	1.8%	1.5%	1.7%	1.2%	1.7%	80.4%	11.5%	91.8%	8.2%	100.0%
KR Korea	1.2%	1.6%	1.3%	1.5%	1.3%	71.4%	16.1%	87.5%	12.5%	100.0%
TW Taiwan	1.0%	1.2%	1.0%	1.9%	1.1%	67.4%	13.6%	81.0%	19.0%	100.0%
IN India	0.6%	0.7%	0.6%	1.0%	0.7%	69.8%	13.2%	83.0%	17.0%	100.0%
MY Malaysia	0.3%	0.4%	0.3%	0.4%	0.3%	67.1%	17.2%	84.3%	15.7%	100.0%
ID Indonesia	0.1%	0.1%	0.1%	0.2%	0.1%	73.4%	13.6%	86.9%	13.1%	100.0%
TH Thailand	0.1%	0.2%	0.1%	0.2%	0.1%	65.0%	17.7%	82.8%	17.2%	100.0%
PH Philippines	0.0%	0.1%	0.0%	0.1%	0.0%	66.2%	20.1%	86.3%	13.7%	100.0%
PK Pakistan *	0.0%	0.0%	0.0%	0.0%	0.0%	35.6%	23.8%	59.5%	40.5%	100.0%
EM EMEA	2.2%	2.0%	2.2%	2.0%	2.2%	77.7%	11.9%	89.6%	10.4%	100.0%
ZA South Africa	0.7%	1.1%	0.8%	1.1%	0.8%	68.0%	16.9%	84.9%	15.1%	100.0%
RU Russia	0.6%	0.1%	0.5%	0.1%	0.5%	96.8%	2.0%	98.8%	1.2%	100.0%
IL Israel	0.3%	0.3%	0.3%	0.2%	0.3%	81.3%	10.7%	92.0%	8.0%	100.0%
PL Poland	0.2%	0.2%	0.2%	0.2%	0.2%	73.4%	14.2%	87.6%	12.4%	100.0%
TR Turkey	0.1%	0.1%	0.1%	0.2%	0.1%	76.2%	9.8%	86.0%	14.0%	100.0%
CZ Czech Republic	0.1%	0.1%	0.1%	0.0%	0.1%	82.2%	15.2%	97.4%	2.6%	100.0%
EG Egypt	0.1%	0.1%	0.1%	0.1%	0.1%	62.6%	17.4%	80.0%	20.0%	100.0%
HU Hungary	0.0%	0.1%	0.1%	0.0%	0.1%	64.3%	29.8%	94.1%	5.9%	100.0%
MA Morocco	0.1%	0.0%	0.0%	0.1%	0.1%	79.4%	0.0%	79.4%	20.6%	100.0%
EM LATIN AMERICA	2.0%	1.8%	2.0%	1.1%	1.9%	81.2%	12.4%	93.6%	6.4%	100.0%
BR Brazil	1.3%	0.9%	1.2%	0.6%	1.2%	83.5%	10.7%	94.2%	5.8%	100.0%
MX Mexico	0.5%	0.4%	0.5%	0.2%	0.5%	84.2%	10.5%	94.8%	5.2%	100.0%
CL Chile	0.1%	0.2%	0.1%	0.1%	0.1%	72.4%	15.2%	87.6%	12.4%	100.0%
PE Peru	0.0%	0.2%	0.1%	0.0%	0.1%	62.1%	35.9%	98.0%	2.0%	100.0%
CO Colombia	0.1%	0.1%	0.1%	0.1%	0.1%	70.8%	19.3%	90.0%	10.0%	100.0%
AR Argentina	0.0%	0.1%	0.0%	0.1%	0.0%	19.3%	45.3%	64.6%	35.4%	100.0%

Data as of Dec 31, 2008

* Pakistan was removed from the MSCI Emerging Markets Index as of the close of Dec 31, 2008

Index Weights of MSCI Country and Regional Global Standard Indices

Evolution of Select Country Weights Over Time

	1999	2002	2007	2008
As a % of ACWI				
WORLD	94.9%	96.0%	88.7%	90.5%
WORLD EX JAPAN	82.2%	87.6%	80.1%	79.9%
EAFE	46.4%	39.8%	43.2%	42.0%
EM	5.1%	4.0%	11.3%	9.5%
NORTH AMERICA				
USA	46.5%	54.0%	41.8%	45.0%
Canada	2.0%	2.2%	3.7%	3.5%
EUROPE				
United Kingdom	8.9%	11.0%	9.6%	8.3%
France	4.8%	3.7%	4.6%	4.6%
Germany	4.9%	2.3%	4.1%	3.7%
Italy	2.0%	1.6%	1.7%	1.5%
Netherlands	2.4%	2.2%	1.2%	1.0%
PACIFIC				
Japan	12.7%	8.4%	8.6%	10.6%
Australia	1.1%	1.9%	2.8%	2.5%
Hong Kong	1.1%	0.6%	1.1%	0.8%
EM ASIA				
China	0.0%	0.3%	1.8%	1.7%
Korea	0.7%	0.9%	1.6%	1.3%
Taiwan	1.1%	0.5%	1.1%	1.0%
India	0.4%	0.2%	0.9%	0.6%
Thailand	0.2%	0.1%	0.2%	0.1%
EM EMEA				
South Africa	0.5%	0.6%	0.8%	0.8%
Russia	0.1%	0.2%	1.1%	0.5%
EM LATIN AMERICA				
Brazil	0.5%	0.3%	1.5%	1.2%
Mexico	0.6%	0.3%	0.5%	0.5%

Data as of Dec 31, 2008

- The weight of the MSCI World Index increased in the MSCI ACWI in 2008 to 90.5% even though MSCI Europe declined in weight.
- The MSCI North America Index returned to its 1999 weight in MSCI ACWI.
- The weights of all Emerging Market regions within MSCI ACWI declined in 2008.

Performance of MSCI Global Investable Market Size Indices in Local Currency and USD

	Gross Perf. in Local Annualized					Gross Perf. in USD Annualized				
	Large Cap	Mid Cap	Standard	Small Cap	IMI	Large Cap	Mid Cap	Standard	Small Cap	IMI
ACWI	-38.5%	-42.7%	-39.2%	-41.5%	-39.4%	-41.2%	-45.0%	-41.8%	-43.4%	-42.0%
WORLD	-37.6%	-42.1%	-38.3%	-40.4%	-38.5%	-39.7%	-43.7%	-40.3%	-41.6%	-40.5%
WORLD EX JAPAN	-37.8%	-43.3%	-37.7%	-41.0%	-38.0%	-42.2%	-47.5%	-41.6%	-44.1%	-41.8%
EAFE	-39.5%	-41.9%	-39.9%	-44.7%	-40.4%	-42.8%	-44.4%	-43.1%	-46.8%	-43.4%
DM NORTH AMERICA	-35.6%	-33.5%	-36.6%	-36.7%	-36.7%	-36.8%	-52.0%	-37.8%	-37.6%	-37.8%
US USA	-36.0%	-42.9%	-37.1%	-35.9%	-37.0%	-36.0%	-42.9%	-37.1%	-35.9%	-37.0%
CA Canada	-31.6%	-30.7%	-31.4%	-45.7%	-33.4%	-45.3%	-44.6%	-45.2%	-56.6%	-46.7%
DM EUROPE	-37.7%	-43.3%	-38.5%	-46.9%	-39.3%	-45.3%	-50.7%	-46.1%	-54.0%	-46.8%
GB United Kingdom	-27.5%	-33.5%	-28.5%	-39.6%	-29.5%	-47.6%	-52.0%	-48.3%	-56.4%	-49.1%
FR France	-40.1%	-37.4%	-39.7%	-51.8%	-40.4%	-43.0%	-40.5%	-42.7%	-54.2%	-43.4%
DE Germany	-40.9%	-58.6%	-42.7%	-43.1%	-42.7%	-43.8%	-60.6%	-45.5%	-45.9%	-45.5%
CH Switzerland	-33.0%	-44.2%	-34.1%	-43.6%	-34.8%	-28.7%	-40.6%	-29.9%	-40.0%	-30.7%
ES Spain	-36.7%	-36.7%	-37.0%	-52.3%	-38.0%	-39.8%	-39.8%	-40.1%	-54.7%	-41.0%
IT Italy	-46.9%	-43.4%	-46.6%	-47.4%	-46.6%	-49.5%	-46.2%	-49.2%	-50.0%	-49.3%
NL Netherlands	-44.4%	-49.8%	-45.2%	-46.3%	-45.2%	-47.1%	-52.2%	-47.9%	-49.0%	-47.9%
SE Sweden	-37.1%	-39.8%	-37.8%	-51.3%	-39.9%	-48.6%	-50.8%	-49.2%	-60.2%	-50.9%
FI Finland	-53.8%	-47.3%	-52.3%	-56.0%	-52.8%	-56.1%	-49.9%	-54.7%	-58.2%	-55.1%
DK Denmark	-46.4%	-41.6%	-44.7%	-64.3%	-47.7%	-49.0%	-44.4%	-47.3%	-66.0%	-50.2%
BE Belgium	-74.7%	-32.0%	-64.4%	-51.0%	-62.4%	-75.9%	-35.4%	-66.1%	-53.4%	-64.3%
NO Norway	-52.3%	-62.4%	-53.5%	-54.5%	-53.6%	-63.0%	-70.9%	-63.9%	-64.7%	-64.0%
GR Greece	-68.7%	-57.2%	-64.2%	-66.7%	-64.6%	-70.3%	-59.3%	-66.0%	-68.3%	-66.4%
AT Austria	-64.3%	-68.7%	-66.6%	-48.4%	-63.2%	-66.1%	-70.3%	-68.2%	-50.9%	-65.0%
IE Ireland	-63.9%	-77.2%	-70.3%	-51.9%	-67.2%	-65.7%	-78.4%	-71.7%	-54.3%	-68.9%
PT Portugal	-45.4%	-55.2%	-49.3%	-38.9%	-47.8%	-48.1%	-57.4%	-51.8%	-41.9%	-50.4%
DM PACIFIC	-42.8%	-39.3%	-42.2%	-41.9%	-42.1%	-36.8%	-32.6%	-36.2%	-35.6%	-36.0%
JP Japan	-43.4%	-37.9%	-42.5%	-35.9%	-41.6%	-30.3%	-23.4%	-29.1%	-21.0%	-28.0%
AU Australia	-36.7%	-42.6%	-37.0%	-53.2%	16.4%	-49.7%	-46.3%	-50.0%	-62.8%	29.6%
HK Hong Kong	-51.1%	-52.8%	-51.5%	-65.5%	-53.0%	-50.8%	-52.5%	-51.2%	-65.2%	-52.7%
SG Singapore	-45.5%	-51.9%	-47.3%	-59.3%	-49.1%	-45.5%	-52.0%	-47.3%	-59.3%	-49.1%
NZ New Zealand	na	-37.7%	-38.6%	-27.7%	-34.1%	na	-52.7%	-53.4%	-45.1%	-50.0%
EM	-45.2%	-48.3%	-45.7%	-51.4%	-46.3%	-52.6%	-55.9%	-53.2%	-58.1%	-53.6%
EM ASIA	-45.8%	-52.5%	-47.1%	-52.9%	-47.8%	-51.5%	-58.4%	-52.8%	-58.5%	-53.5%
CN China	-49.9%	-58.5%	-51.1%	-57.0%	-51.4%	-49.6%	-58.2%	-50.8%	-56.7%	-51.1%
KR Korea	-43.5%	-43.9%	-39.5%	-44.3%	-40.0%	-49.8%	-58.3%	-55.1%	-58.6%	-55.4%
TW Taiwan	-42.8%	-55.7%	-45.2%	-46.2%	-45.3%	-43.5%	-56.2%	-45.9%	-46.8%	-46.0%
IN India	-55.4%	-60.0%	-56.3%	-66.0%	-58.2%	-63.9%	-67.6%	-64.6%	-72.5%	-66.2%
MY Malaysia	-36.6%	-43.6%	-38.5%	-47.8%	-39.9%	-39.4%	-46.1%	-41.2%	-50.1%	-42.6%
ID Indonesia	-47.3%	-57.6%	-49.2%	-60.1%	-51.0%	-54.6%	-63.5%	-56.2%	-65.6%	-57.8%
TH Thailand	-47.9%	-39.2%	-46.6%	-54.1%	-47.8%	-49.6%	-41.1%	-48.3%	-55.5%	-49.5%
PH Philippines	-38.3%	-55.8%	-44.6%	-61.3%	-47.2%	-46.4%	-61.6%	-51.9%	-66.4%	-54.2%
PK Pakistan *	-67.9%	-64.3%	-66.7%	-64.5%	-66.1%	-75.0%	-72.2%	-74.0%	-72.3%	-73.6%
EM EMEA	-49.4%	-42.1%	-48.6%	-45.8%	-48.3%	-56.1%	-51.2%	-55.6%	-54.6%	-55.4%
ZA South Africa	-14.6%	-20.4%	-16.0%	-25.4%	-17.4%	-36.9%	-41.2%	-37.9%	-44.9%	-38.9%
RU Russia	-72.0%	-74.3%	-72.2%	-84.3%	-72.4%	-73.7%	-74.1%	-73.8%	-86.0%	-74.0%
IL Israel	-25.3%	-49.8%	-30.0%	-58.5%	-33.8%	-24.0%	-48.7%	-28.8%	-58.6%	-32.7%
PL Poland	-41.5%	-60.5%	-45.2%	-64.3%	-48.2%	-51.5%	-67.2%	-54.5%	-70.4%	-57.0%
TR Turkey	-47.5%	-62.0%	-50.1%	-60.7%	-51.5%	-60.1%	-71.2%	-62.1%	-70.1%	-63.2%
CZ Czech Republic	-34.7%	-55.7%	-39.2%	-37.3%	-39.4%	-38.5%	-58.2%	-42.7%	-41.0%	-42.9%
EG Egypt	-52.9%	-50.2%	-52.4%	-47.6%	-51.7%	-52.8%	-49.4%	-52.4%	-47.7%	-51.7%
HU Hungary	-63.7%	-32.1%	-57.4%	-54.5%	-57.2%	-67.2%	-38.7%	-61.5%	-58.9%	-61.3%
MA Morocco	-5.4%	na	-7.2%	-11.6%	-6.5%	-9.2%	na	-10.9%	-15.1%	-10.2%
EM LATIN AMERICA	-37.2%	-39.7%	-37.7%	-50.6%	-38.4%	-50.9%	-52.8%	-51.3%	-60.8%	-51.8%
BR Brazil	-42.1%	-44.0%	-42.4%	-55.8%	-43.2%	-55.8%	-57.2%	-56.1%	-66.2%	-56.6%
MX Mexico	-25.6%	-45.4%	-27.6%	-44.8%	-28.3%	-41.4%	-57.0%	-42.9%	-56.5%	-43.5%
CL Chile	-16.6%	-16.5%	-17.3%	-33.3%	-19.5%	-34.8%	-34.8%	-35.4%	-47.9%	-37.1%
PE Peru	-40.9%	-23.5%	-38.9%	-61.4%	-39.7%	-41.5%	-29.1%	-40.1%	-63.2%	-41.0%
CO Colombia	-20.7%	-5.3%	-16.5%	-14.2%	-17.3%	-28.8%	-15.0%	-25.1%	-23.0%	-25.8%
AR Argentina	-49.0%	-43.0%	-50.1%	-56.5%	-48.0%	-53.5%	-48.0%	-54.4%	-60.3%	-52.5%

Data as of Dec 31, 2008

* Pakistan was removed from the MSCI Emerging Markets Index as of the close of Dec 31, 2008

Performance of MSCI Global Standard Style Indices (In USD)

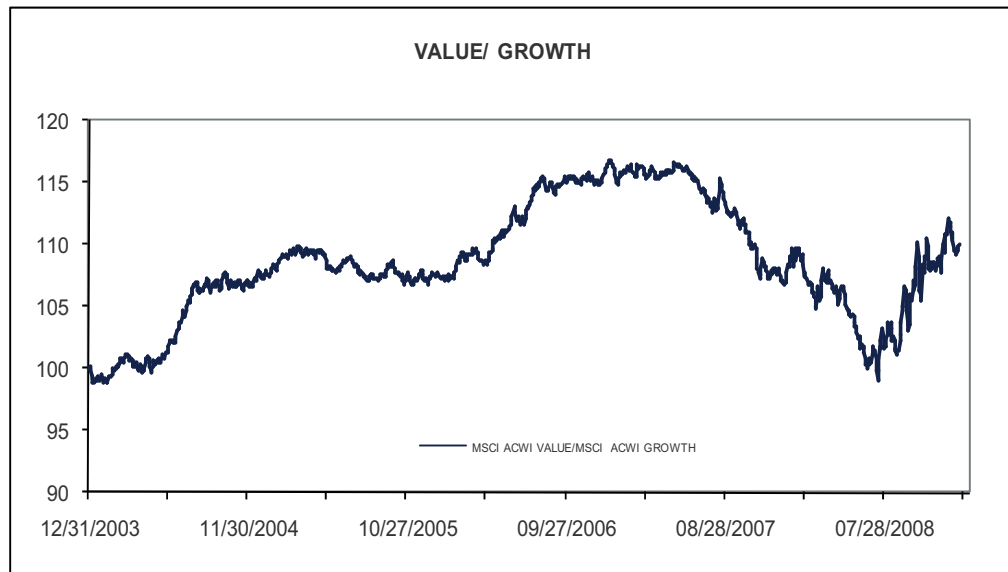
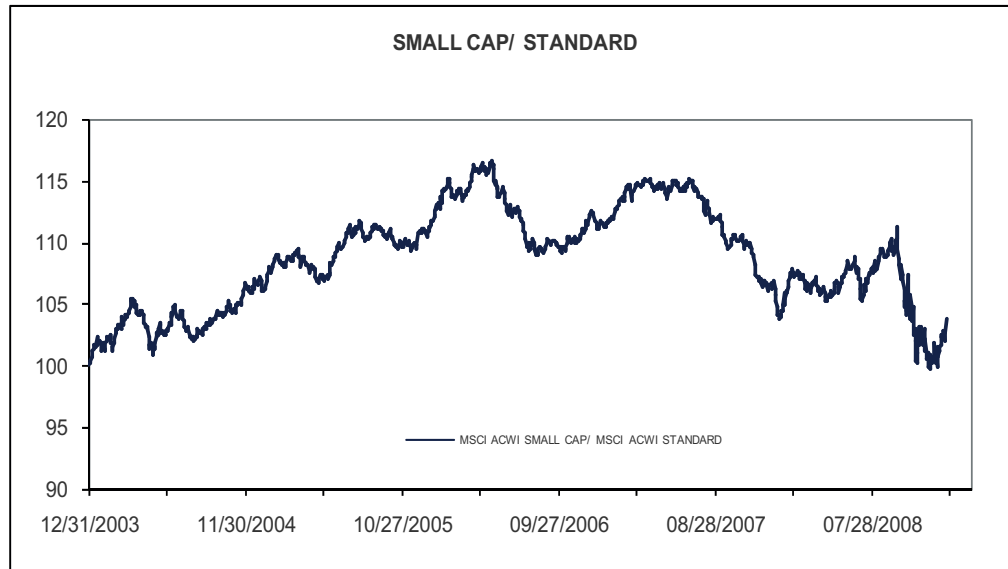
				Gross Performance in USD (Jan 1, 2008 - December 31, 2008)			Performance Differential
				Standard Index	Value Index	Growth Index	Value - Growth
ACWI				-41.8%	-41.0%	-42.7%	1.7%
WORLD				-40.3%	-39.8%	-40.9%	1.1%
WORLD EX JAPAN				-41.6%	-41.6%	-41.6%	0.0%
EAFE				-43.1%	-43.7%	-43.1%	-0.6%
DM NORTH AMERICA				-37.8%	-36.3%	-39.5%	3.2%
	US	USA		-37.1%	-35.4%	-39.0%	3.6%
	CA	Canada		-45.2%	-46.1%	-45.1%	-0.9%
DM EUROPE				-46.1%	-48.7%	-43.4%	-5.3%
	GB	United Kingdom		-48.3%	-48.1%	-48.9%	0.9%
	FR	France		-42.7%	-42.7%	-43.0%	0.2%
	DE	Germany		-45.5%	-50.9%	-41.5%	-9.4%
	CH	Switzerland		-29.9%	-49.9%	-22.0%	-28.0%
	ES	Spain		-40.1%	-47.9%	-33.4%	-14.5%
	IT	Italy		-49.2%	-48.2%	-50.5%	2.3%
	NL	Netherlands		-47.9%	-56.9%	-41.1%	-15.8%
	SE	Sweden		-49.2%	-50.6%	-48.6%	-2.0%
	FI	Finland		-54.7%	-43.5%	-58.7%	15.1%
	DK	Denmark		-47.3%	-62.5%	-43.8%	-18.7%
	BE	Belgium		-66.1%	-70.2%	-51.0%	-19.2%
	NO	Norway		-63.9%	-59.3%	-64.0%	4.7%
	GR	Greece		-66.0%	-45.9%	-68.5%	22.6%
	AT	Austria		-68.2%	-74.2%	-62.3%	-12.0%
	IE	Ireland		-71.7%	-87.8%	-57.6%	-30.2%
	PT	Portugal		-51.8%	-41.7%	-58.0%	16.3%
DM PACIFIC				-36.2%	-31.9%	-40.4%	8.5%
	JP	Japan		-29.1%	-23.7%	-34.5%	10.8%
	AU	Australia		-50.0%	-51.6%	-48.7%	-2.9%
	HK	Hong Kong		-51.2%	-39.9%	-61.7%	21.8%
	SG	Singapore		-47.3%	-41.0%	-53.0%	12.0%
	NZ	New Zealand		-53.4%	-56.2%	-50.4%	-5.7%
EM				-53.2%	-50.1%	-56.2%	6.1%
EM ASIA				-52.8%	-49.1%	-56.4%	7.3%
	CN	China		-50.8%	-49.2%	-52.7%	3.5%
	KR	Korea		-55.1%	-48.6%	-61.1%	12.5%
	TW	Taiwan		-45.9%	-43.7%	-48.2%	4.5%
	IN	India		-64.6%	-59.9%	-69.4%	9.5%
	MY	Malaysia		-41.2%	-33.6%	-48.5%	14.9%
	ID	Indonesia		-56.2%	-49.3%	-63.4%	14.1%
	TH	Thailand		-48.3%	-49.7%	-46.7%	-3.0%
	PH	Philippines		-51.9%	-43.9%	-60.0%	16.1%
	PK	Pakistan *		-74.0%	-69.7%	-77.6%	8.0%
EM EMEA				-55.6%	-52.9%	-58.2%	5.3%
	ZA	South Africa		-37.9%	-30.5%	-45.0%	14.5%
	RU	Russia		-73.8%	-71.1%	-76.1%	5.0%
	IL	Israel		-28.8%	-32.1%	-26.0%	-6.0%
	PL	Poland		-54.5%	-54.0%	-55.1%	1.1%
	TR	Turkey		-62.1%	-61.7%	-62.7%	1.0%
	CZ	Czech Republic		-42.7%	-35.3%	-49.4%	14.0%
	EG	Egypt		-52.4%	-49.8%	-56.7%	6.9%
	HU	Hungary		-61.5%	-57.0%	-65.5%	8.5%
	MA	Morocco		-10.9%	-6.3%	-16.1%	9.8%
EM LATIN AMERICA				-51.3%	-48.6%	-54.0%	5.4%
	BR	Brazil		-56.1%	-52.6%	-59.5%	7.0%
	MX	Mexico		-42.9%	-41.6%	-44.3%	2.7%
	CL	Chile		-35.4%	-32.3%	-38.4%	6.0%
	PE	Peru		-40.1%	-41.8%	-39.3%	-2.5%
	CO	Colombia		-25.1%	-32.2%	-22.7%	-9.6%
	AR	Argentina		-54.4%	-48.7%	-60.3%	11.6%

Data as of Dec 31, 2008

* Pakistan was removed from the MSCI Emerging Markets Index as of the close of Dec 31, 2008

Performance of MSCI Size and Style Indices

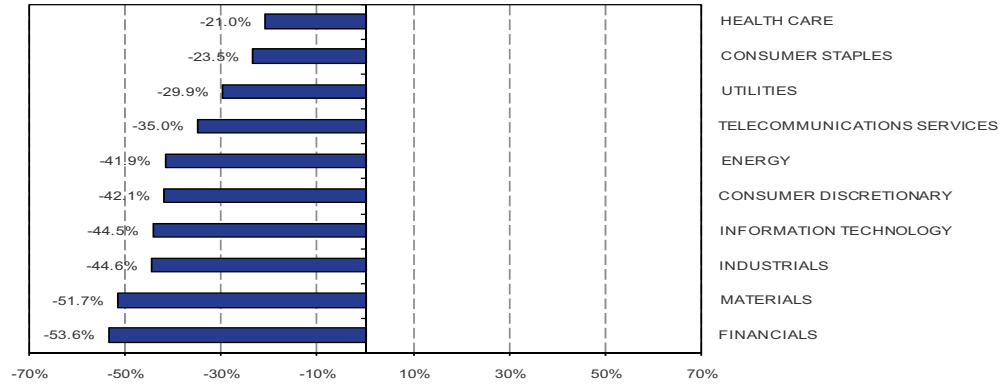
- Continuing a trend that started in 2006, Small Caps underperformed Large Caps in 2008.
- Value, which was underperforming Growth going into 2008, reversed course in the middle of 2008.



Data as of Dec 31, 2008.

Performance of MSCI Global Standard Sector Indices in 2008 (USD Terms)

ACWI Sector Performance 2008



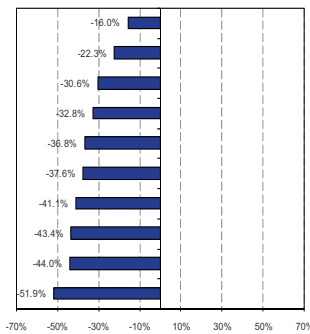
- All sectors within MSCI ACWI IMI showed negative performance in 2008 in USD terms.

- Healthcare was the best performer whereas Financials was the worst performer.

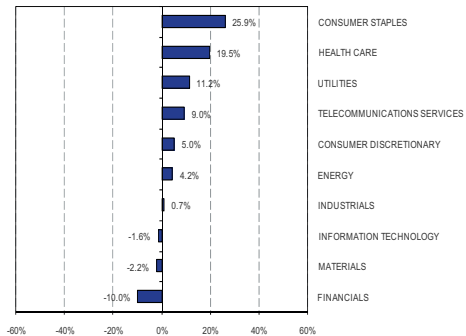
- In Developed Markets, only Utilities in the MSCI Pacific Index posted a positive return of 12.4%.

- Examining regional sector performance relative to MSCI ACWI performance, the MSCI Pacific Index sectors outperformed in 2008.

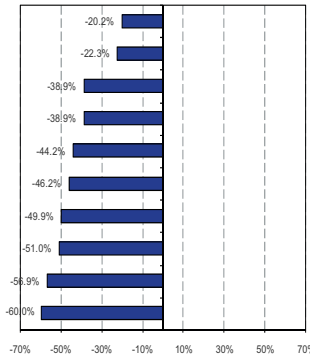
North America



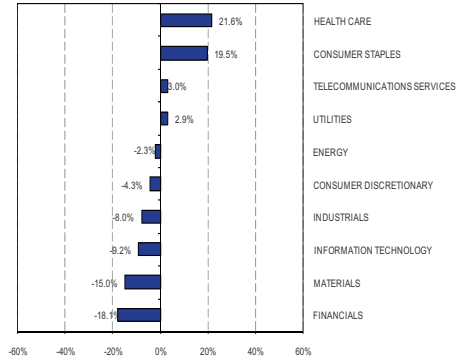
North America- ACWI



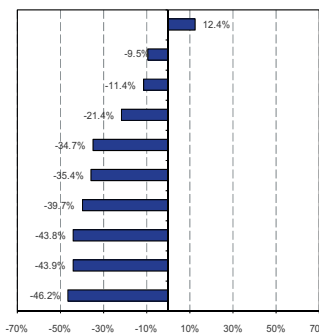
Europe



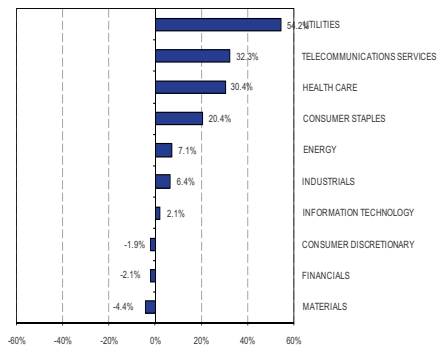
Europe- ACWI



Pacific

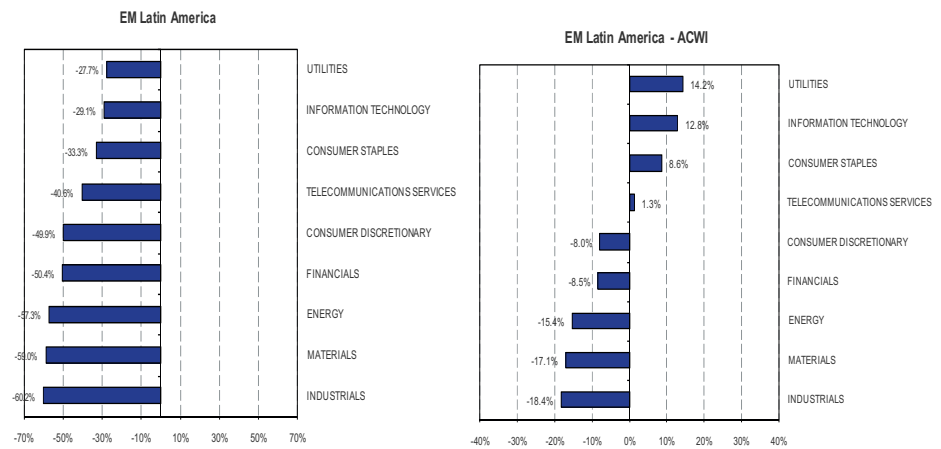
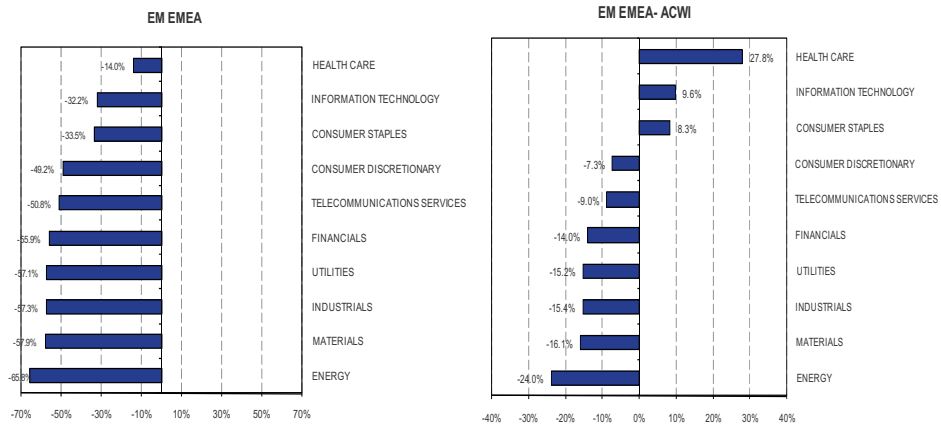
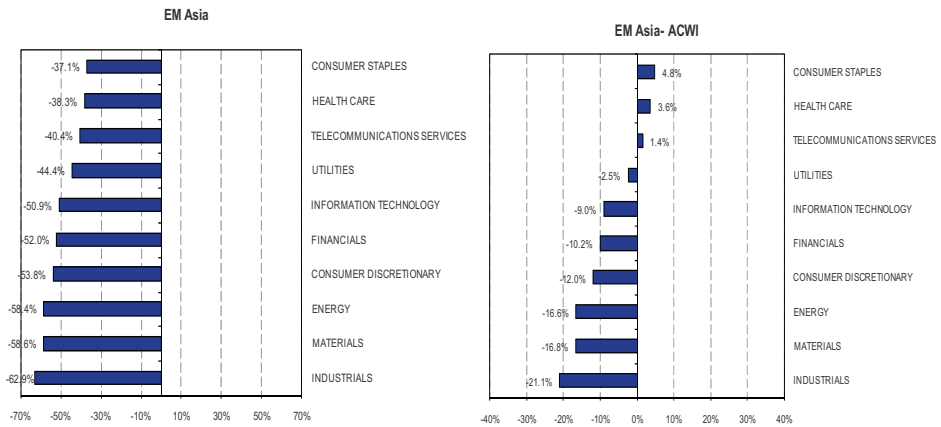


Pacific- ACWI



Performance of MSCI Global Standard Sector Indices in 2008 (USD Terms) (Continued)

- All sectors in Emerging Markets also posted negative returns in 2008 with Energy, Industrials and Materials being the bottom performers across all regions.



MSCI ACWI Regional and Country Index Ratios

	Value Index Level Valuation Ratios at December Month End						Growth Index Level Valuation Ratios at December Month End									
	P / BV		P / E 12 month fwd		Yield		LT fwd EPS G	ST fwd EPS G	Current Internal Growth Rate	LT his SPS G	LT his EPS G					
	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007				
ACWI	1.4	2.5	10.4	13.8	3.9	2.3	8.0	11.6	1.5	11.6	7.8	11.6	11.7	11.0	16.2	21.5
WORLD	1.4	2.5	10.6	13.8	3.9	2.3	7.7	10.9	1.7	10.9	7.5	10.9	11.0	9.9	15.7	20.9
WORLD EX JAPAN	1.5	2.6	10.3	13.7	4.1	2.4	8.6	10.8	2.1	10.8	7.9	10.8	11.4	10.1	16.3	20.4
EAFE	1.2	2.2	9.8	12.9	5.0	2.7	4.1	9.0	1.0	9.0	7.3	9.0	8.4	7.2	15.5	21.6
DM NORTH AMERICA	1.7	2.8	11.4	14.7	3.0	1.9	10.7	12.7	2.4	12.7	7.7	12.7	13.0	12.3	15.8	20.3
US USA	1.7	2.8	11.5	14.7	2.9	1.9	10.7	12.8	3.3	12.8	7.6	12.8	13.0	12.2	15.5	19.9
CA Canada	1.5	2.8	10.0	15.0	3.7	2.2	10.7	11.0	-6.5	11.0	9.7	11.0	14.3	14.5	19.3	24.9
DM EUROPE	1.3	2.3	8.7	12.2	5.6	3.0	5.0	8.0	2.1	8.0	8.4	8.0	8.4	6.4	17.4	20.8
GB United Kingdom	1.3	2.4	9.0	11.9	5.7	3.3	3.8	7.2	-10.7	7.2	11.6	7.2	9.3	9.3	14.1	17.4
FR France	1.2	2.1	8.4	12.0	5.4	2.9	3.6	6.5	-2.1	6.5	7.8	6.5	5.9	0.9	17.8	25.1
DE Germany	1.2	2.1	8.9	12.7	5.0	2.4	5.7	8.2	12.5	8.2	6.6	8.2	4.7	3.5	21.9	25.4
CH Switzerland	1.9	2.9	10.2	13.1	3.2	2.2	7.5	11.7	100.4	11.7	2.2	11.7	9.5	6.3	19.4	24.0
ES Spain	1.5	2.8	8.0	12.3	6.6	3.1	8.2	7.7	-1.5	7.7	10.1	7.7	15.9	13.0	17.9	15.6
IT Italy	0.9	1.8	7.2	11.3	9.0	4.1	5.0	6.4	-6.2	6.4	5.2	6.4	8.8	6.7	15.9	22.9
NL Netherlands	1.4	2.3	8.3	11.9	6.9	3.1	3.7	6.3	13.2	6.3	10.8	6.3	2.9	-1.2	15.6	10.5
SE Sweden	1.3	2.5	9.4	11.8	6.1	3.2	4.8	6.9	-13.8	6.9	7.0	6.9	11.8	9.8	18.8	27.3
FI Finland	1.7	3.6	10.0	14.8	6.4	2.6	-3.2	9.9	-13.6	9.9	9.7	9.9	14.8	7.8	15.2	9.9
DK Denmark	1.5	3.1	10.1	14.9	2.6	1.3	14.4	13.2	8.1	13.2	10.2	13.2	13.6	10.9	25.5	18.9
BE Belgium	0.6	1.8	6.6	10.0	10.4	4.8	6.3	8.1	43.5	8.1	2.9	8.1	6.3	5.3	13.3	24.0
NO Norway	1.2	2.6	6.8	13.0	6.5	2.3	1.8	6.6	-14.9	6.6	13.4	6.6	13.6	17.7	23.3	34.3
GR Greece	1.1	3.2	5.5	13.4	6.8	2.6	14.2	21.5	3.2	21.5	10.3	21.5	12.7	12.2	22.4	22.5
IE Ireland	0.6	1.9	6.9	8.9	9.9	3.2	2.3	7.9	-42.3	7.9	12.7	7.9	11.0	1.0	13.8	16.6
AT Austria	0.8	1.8	5.7	10.5	6.5	2.1	6.0	10.8	-14.5	10.8	10.8	10.8	12.3	11.9	27.1	30.7
PT Portugal	1.6	2.9	10.1	15.2	5.6	3.2	8.9	7.7	8.9	7.7	6.2	7.7	15.0	3.7	19.9	21.2
DM PACIFIC	1.1	1.9	13.0	15.2	3.7	2.0	2.2	11.5	-1.9	11.5	5.6	11.5	8.4	9.0	11.9	23.4
JP Japan	1.0	1.7	14.1	14.8	2.8	1.5	-0.1	12.0	-2.1	12.0	5.7	12.0	7.5	8.1	11.0	25.4
AU Australia	1.6	3.0	10.4	14.9	7.0	3.7	7.8	8.7	2.4	8.7	3.9	8.7	10.5	10.4	12.2	18.9
HK Hong Kong	1.0	2.4	12.0	21.5	5.0	2.0	7.2	14.3	-6.8	14.3	6.9	14.3	13.2	13.3	18.7	20.8
SG Singapore	1.2	2.3	9.8	15.0	5.7	2.5	5.4	14.1	-10.1	14.1	9.3	14.1	13.2	11.9	18.9	17.8
NZ New Zealand	1.4	2.4	11.5	14.4	7.6	5.2	3.1	6.2	-14.6	6.2	4.9	6.2	5.1	6.8	1.2	7.0
EM	1.4	2.9	8.6	13.8	4.1	1.9	11.3	18.2	-0.5	18.2	10.7	18.2	19.1	20.3	21.0	26.2
EM ASIA	1.4	2.8	10.8	15.0	4.2	1.8	9.7	21.1	-0.9	21.1	9.1	21.1	18.0	18.0	18.5	21.6
CN China	1.8	4.5	10.1	19.3	3.1	1.2	13.8	24.3	6.8	24.3	11.7	24.3	21.4	21.7	24.0	26.0
KR Korea	1.0	1.8	9.4	11.8	2.7	1.6	6.9	18.7	9.6	18.7	8.4	18.7	14.3	8.8	16.8	18.7
TW Taiwan	1.2	2.2	21.0	11.9	8.5	3.8	3.2	20.3	-38.5	20.3	4.5	20.3	17.5	24.5	13.0	18.7
IN India	2.2	6.4	9.9	23.1	1.8	0.7	16.9	23.8	7.0	23.8	16.8	23.8	24.1	20.9	21.9	25.0
MY Malaysia	1.5	2.5	11.4	16.0	4.1	2.0	3.8	15.3	-3.3	15.3	8.6	15.3	9.3	11.1	15.0	12.6
ID Indonesia	2.4	5.8	8.4	16.1	5.4	1.5	16.4	24.8	-0.2	24.8	14.7	24.8	17.5	23.8	17.4	18.4
TH Thailand	1.1	2.4	7.4	12.1	6.5	2.9	5.2	11.0	-6.2	11.0	8.4	11.0	14.9	19.3	6.7	20.1
PH Philippines	1.8	2.9	10.4	16.2	4.4	2.2	8.8	14.6	9.8	14.6	7.5	14.6	7.7	11.5	14.9	22.8
PK Pakistan *	1.1	3.7	3.6	10.9	12.5	4.1	8.4	12.8	9.5	12.8	15.3	12.8	25.9	21.7	27.2	32.2
EM EMEA	1.2	2.8	6.1	12.1	4.3	2.0	11.9	12.9	-3.3	12.9	13.3	12.9	19.1	22.1	22.6	29.6
ZA South Africa	1.9	3.1	8.5	11.3	4.5	2.7	11.8	11.7	16.5	11.7	9.0	11.7	15.8	12.7	19.9	17.8
RU Russia	0.7	2.6	3.5	11.9	3.5	1.2	12.0	13.8	-16.4	13.8	17.7	13.8	28.2	29.5	28.6	36.8
IL Israel	1.7	2.5	9.4	14.8	2.8	2.1	10.7	13.1	20.3	13.1	7.2	13.1	14.5	15.5	17.9	26.3
PL Poland	1.2	2.5	8.0	12.0	5.9	3.6	15.8	18.6	-1.1	18.6	9.6	18.6	13.8	16.3	20.0	30.0
TR Turkey	1.1	2.3	5.4	10.9	5.8	2.3	12.4	9.4	-1.6	9.4	14.1	9.4	16.3	21.7	25.4	30.8
CZ Czech Republic	2.0	3.6	8.1	16.6	6.0	2.5	2.8	7.5	15.6	7.5	8.5	7.5	15.3	21.2	28.8	30.9
EG Egypt	1.7	5.5	7.1	17.4	6.3	1.8	10.3	15.0	-3.2	15.0	13.5	15.0	25.6	36.2	29.8	40.3
HU Hungary	0.9	2.6	5.3	10.8	4.6	2.3	6.4	7.6	-16.7	7.6	21.4	7.6	12.1	17.0	11.8	25.1
MA Morocco	5.2	6.1	16.6	19.1	3.2	2.7	na	na	13.7	na	3.6	3.9	17.9	24.8	21.5	22.9
EM LATIN AMERICA	1.7	3.1	7.7	13.3	4.0	2.1	17.2	15.4	5.0	15.4	11.8	15.4	22.1	24.1	25.8	33.8
BR Brazil	1.5	3.1	6.7	13.6	4.7	2.2	14.2	14.2	5.4	14.2	11.8	14.2	21.5	25.0	25.0	32.6
MX Mexico	2.4	3.2	10.6	12.3	2.8	1.6	27.7	20.4	7.3	20.4	12.7	20.4	22.2	24.6	28.8	36.6
CL Chile	1.8	2.4	13.1	18.2	2.6	1.7	13.1	9.7	1.1	9.7	8.7	9.7	17.2	11.7	23.2	28.0
PE Peru	3.2	5.6	7.6	12.7	4.7	3.7	15.0	15.0	2.8	15.0	15.3	15.0	30.2	31.2	35.1	47.0
CO Colombia	1.5	1.8	na	na	2.4	2.3	na	na	na	na	7.8	4.7	43.1	7.3	4.9	16.7
AR Argentina	0.8	2.9	5.3	10.5	2.7	1.6	29.6	9.0	-30.1	9.0	20.5	9.0	20.1	23.1	22.5	47.4

Data as of Dec 31, 2008

* Pakistan was removed from the MSCI Emerging Markets Index as of the close of Dec 31, 2008

MSCI ACWI Industry Group Index Ratios

- Valuation ratios for all industry groups in MSCI ACWI also improved significantly from their 2007 levels.
- Banks displayed the highest dividend yield at 7.4% while Insurance, Banks, and Energy had the three lowest forward P/E ratios.

	Value Index Level Valuation Ratios at December Month End						Growth Index Level Valuation Ratios at December Month End									
	P / BV		P / E 12 month fwd		Yield		LT fwd EPS G		ST fwd EPS G		Current Internal Growth Rate		LT his SPS G		LT his EPS G	
	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007
ENERGY	1.5	3.0	8.4	12.4	3.4	1.8	5.7	9.1	-22.5	9.8	18.7	15.9	17.2	19.1	22.2	33.3
MATERIALS	1.2	2.8	8.8	13.1	4.5	1.9	7.2	12.0	-14.9	10.4	12.2	13.0	14.8	14.6	23.8	31.3
CAPITAL GOODS	1.4	3.0	9.4	15.2	3.9	1.8	8.6	15.6	-4.9	13.8	11.5	11.1	9.4	8.1	22.1	22.2
COMML & PROF SVCS	2.2	3.2	13.1	14.9	2.9	2.0	10.6	12.2	-0.9	12.5	9.9	12.0	11.3	9.4	13.7	14.3
TRANSPORTATION	1.5	2.4	12.2	14.3	3.2	1.9	7.2	11.4	-4.9	8.0	9.1	10.3	9.1	10.0	13.2	17.7
AUTO & COMPONENTS	0.8	1.9	23.4	10.9	4.3	1.9	-3.8	7.3	-42.3	17.7	3.7	8.2	6.4	7.2	17.9	9.2
CONS DUR & APPAREL	1.1	2.1	13.2	15.4	3.0	1.6	4.7	16.0	10.7	27.8	8.2	6.8	8.9	9.3	16.1	17.3
CONSUMER SERVICES	2.7	3.5	13.7	17.6	3.0	2.2	10.1	13.0	0.4	12.6	13.4	9.7	9.9	11.4	13.6	14.0
MEDIA	1.3	2.1	10.8	16.6	3.1	1.8	9.5	12.6	-8.2	15.9	7.5	7.5	8.1	7.0	22.6	33.9
RETAILING	1.8	2.8	13.0	14.5	2.6	1.7	11.8	15.3	-4.9	10.1	11.1	12.5	13.2	14.2	15.0	19.5
FOOD & STAPLES RETL	2.0	2.9	13.2	16.8	2.3	1.7	10.8	13.2	7.7	13.3	9.2	9.7	9.1	8.5	11.8	9.5
FOOD BEV & TOBACCO	2.9	4.3	12.6	17.9	3.6	2.4	8.5	9.8	6.1	9.3	12.4	11.0	12.7	4.5	11.0	7.4
HOUSE & PERS PROD	3.6	4.4	14.7	19.9	2.6	1.9	10.1	11.5	6.9	13.7	13.0	11.3	8.5	7.9	9.5	9.1
H CARE EQUIP & SVC	2.1	3.5	11.0	17.4	1.0	0.5	12.6	14.6	9.9	14.2	13.5	14.8	12.7	12.3	13.5	16.8
PHARMA & BIOTECH & LIFE SCS	2.7	3.6	11.6	14.6	3.1	2.5	8.6	9.8	7.7	9.5	9.4	10.3	10.5	9.4	12.9	11.0
BANKS	0.9	1.7	8.1	10.6	7.4	4.0	6.9	9.0	5.5	9.7	4.6	8.2	na	na	12.0	18.8
DIVERS FINANC	0.8	1.8	9.0	10.5	5.8	3.3	9.6	11.2	NM	29.1	-6.2	10.8	12.8	12.7	10.6	22.9
INSURANCE	1.0	1.6	7.6	10.1	4.4	2.5	6.7	9.8	48.2	2.0	-1.1	11.0	2.9	1.7	18.3	27.0
REAL ESTATE	1.0	1.8	13.9	20.7	5.7	3.0	8.1	11.9	-15.1	0.5	2.1	3.4	7.8	7.5	14.1	17.2
SOFTWARE & SERVICES	3.2	5.9	11.6	20.6	1.4	0.7	14.4	17.3	9.0	18.9	18.5	15.9	20.6	19.6	24.1	25.8
TECH HARD & EQUIP	1.6	3.3	12.1	16.2	2.1	0.9	7.1	15.5	-11.0	21.1	12.3	11.5	15.4	15.2	19.3	27.8
SEMICON & SEMICON EQUIP	1.5	2.7	33.5	15.9	3.5	1.8	9.1	15.7	-43.5	22.7	5.9	9.1	12.4	12.9	10.4	26.7
TELECOM SVC	1.7	2.5	10.5	15.3	5.3	3.2	7.9	10.5	5.0	10.9	5.7	5.1	10.0	8.2	11.5	16.6
UTILITIES	1.5	2.3	11.7	16.9	4.2	2.8	7.1	8.6	16.0	9.7	4.4	6.5	7.0	5.1	9.8	12.6
ACWI	1.4	2.5	10.4	13.8	3.9	2.3	8.0	11.6	1.5	12.4	7.8	10.2	11.7	11.0	16.2	21.5

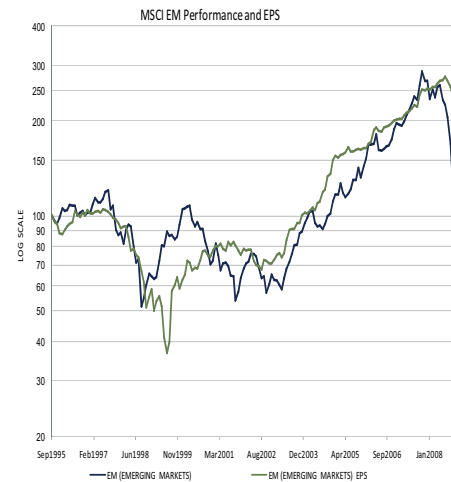
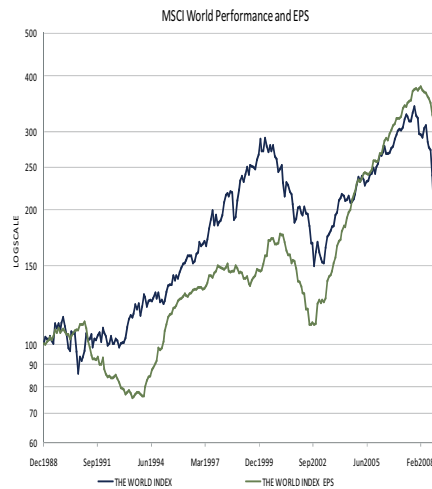
Data as of Dec 31, 2008

Long Term Valuation, Earnings & Stock Prices

- Valuations have declined to their lowest levels in years.



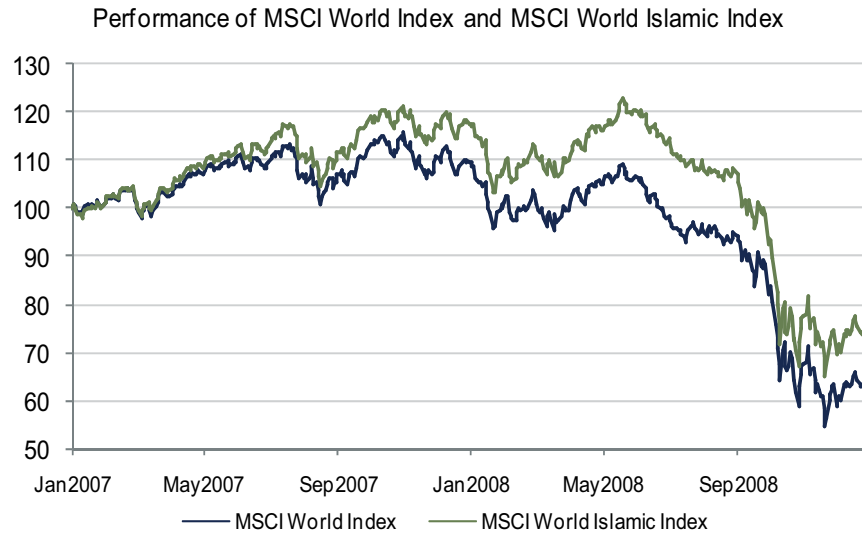
- Stock prices appear to follow earnings. The recent stock price declines seem to be more severe than the earnings declines.



Performance and Sector Weights of MSCI Global Islamic Indices

The MSCI Global Islamic Indices reflect Sharia investment principles and are based upon the MSCI Global Investable Market Indices but exclude any non-compliant securities in accordance with the MSCI Islamic Index Series Methodology.

- The MSCI World Islamic Index outperformed the MSCI World Index in 2008.



2008 Sector Weights of MSCI World and MSCI World Islamic Indices

- Financials, Energy and Healthcare show the largest weight differences between the MSCI World Index and the MSCI World Islamic Index.

Sector	MSCI World Index	MSCI World Islamic Index	(Islamic - Standard)
Energy	11.6%	21.9%	10.3%
Health Care	11.9%	19.2%	7.3%
Materials	5.8%	10.1%	4.2%
Information Technology	10.2%	11.5%	1.3%
Utilities	5.7%	5.8%	0.1%
Consumer Staples	11.1%	10.5%	-0.6%
Telecommunications Services	5.3%	4.2%	-1.0%
Industrials	10.9%	8.9%	-2.0%
Consumer Discretionary	8.9%	6.8%	-2.0%
Financials	18.6%	1.1%	-17.5%

Data as of Dec 31, 2008

2008 Performance of MSCI Thematic & Strategy Indices

- The MSCI World Agriculture & Food Chain Index and the MSCI World Minimum Volatility Index were the best performers among the family of thematic and strategy indices.

MSCI INDEX		Gross Perf. USD
STANDARD	MSCI WORLD	-40.3%
	MSCI EMERGING MARKETS	-53.2%
YIELD-BASED	MSCI WORLD HIGH DIVIDEND YIELD	-42.4%
	ACWI REITS	-45.0%
ALTERNATIVE WEIGHTING	MSCI WORLD EQUAL WEIGHTED	-41.9%
	MSCI WORLD GDP	-41.7%
STRATEGIES AND THEMES	MSCI WORLD COMMODITY PRODUCERS	-41.5%
	MSCI WORLD INFRASTRUCTURE	-30.1%
	MSCI WORLD AGRICULTURE & FOOD CHAIN	-29.1%
RISK-BASED	MSCI WORLD MINIMUM VOLATILITY	-29.2%

Data as of Dec 31, 2008

Yield-Based Indices Relative to MSCI World



Alternative Weighting Indices Relative to MSCI World



Thematic and Strategy Indices Relative to MSCI World



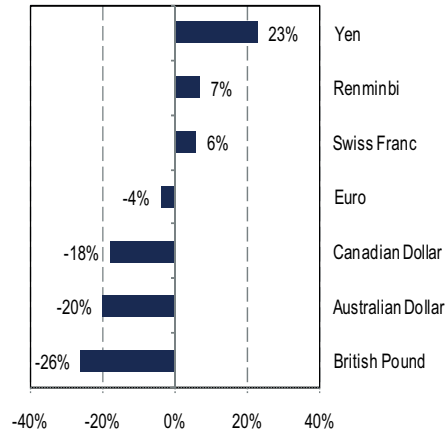
Risk-Based Index Relative to MSCI World



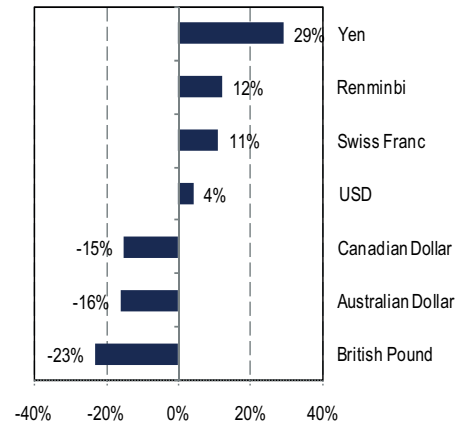
Performance of Currencies

- Many major currencies declined against the US dollar in 2008.
- The Japanese Yen appreciated the most and the British Pound depreciated the most against the USD and the Euro.

2008 Currency Performance Against USD



2008 Currency Performance Against Euro

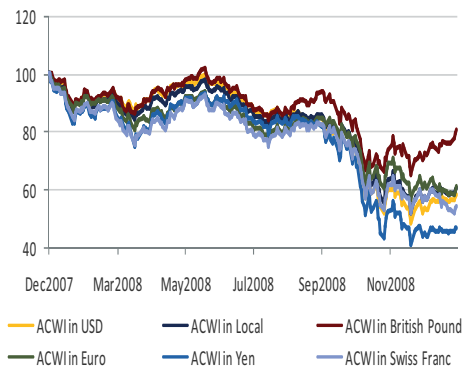


- The MSCI Currency Indices, which capture the performance of the currency movements and the interest rate differentials, declined beginning in the middle of 2008.
- These currency moves impacted the performance of unhedged indices.

MSCI Currency Indices



ACWI Performance in Different Currencies



Performance of MSCI US Equity Indices

Index Name	Compound Annual Returns			
	1 Year	3 Years	5 Years	10 Years
MSCI US Prime Market 750 Index	-37.1%	-8.2%	-1.7%	-1.2%
MSCI US Prime Market Value Index	-36.0%	-7.8%	-0.6%	1.6%
MSCI US Prime Market Growth Index	-38.2%	-8.7%	-3.0%	-4.2%
MSCI US Large Cap 300 Index	-36.1%	-7.6%	-1.9%	-2.0%
MSCI US Large Cap Value Index	-35.8%	-7.1%	-0.8%	0.9%
MSCI US Large Cap Growth Index	-36.5%	-8.2%	-3.2%	-5.0%
MSCI US Mid Cap 450 Index	-41.8%	-11.1%	-0.7%	3.3%
MSCI US Mid Cap Value Index	-36.5%	-10.6%	0.5%	5.7%
MSCI US Mid Cap Growth Index	-47.1%	-12.0%	-2.3%	-0.4%
MSCI US Small Cap 1750 Index	-36.2%	-9.3%	-0.7%	4.7%
MSCI US Small Cap Value Index	-32.1%	-9.0%	-0.2%	6.0%
MSCI US Small Cap Growth Index	-40.1%	-9.7%	-1.5%	2.4%
US Investable Market 2500 Index	-37.0%	-8.3%	-1.6%	-0.6%
US Investable Market Value	-35.6%	-7.9%	-0.5%	2.0%
US Investable Market Growth	-38.4%	-8.8%	-2.8%	-3.5%
MSCI US Broad Market Index	-37.0%	-8.4%	-1.7%	N/A
MSCI US Micro Cap Index	-43.0%	-15.0%	-6.1%	N/A
US IMI/ENERGY	-36.9%	0.9%	13.1%	10.9%
US IMI/MATERIALS	-46.7%	-6.9%	-0.4%	3.0%
US IMI/INDUSTRIALS	-39.9%	-7.9%	-0.4%	1.6%
US IMI/CONSUMER DISCR	-38.1%	-13.8%	-6.9%	-2.6%
US IMI/CONSUMER STAPLES	-16.4%	3.1%	4.6%	2.7%
US IMI/HEALTH CARE	-23.4%	-4.0%	0.0%	0.8%
US IMI/FINANCIALS	-49.1%	-20.5%	-9.5%	-1.4%
US IMI/INFORMATION TECH	-42.8%	-10.4%	-5.5%	-5.4%
US IMI/TELECOM SVC	-33.2%	0.5%	3.4%	-6.6%
US IMI/UTILITIES	-28.0%	1.0%	7.9%	3.5%

Data as of Dec 31, 2008

- Mid Caps performed the worst among the size segments in the MSCI US Investable Market Indices with a return of -41.8%

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