Managing Style Portfolios vs. Low Volatility Benchmarks

Dr. Michael Heldmann, CFA
Vice President
Senior Portfolio Manager
Systematic Equity

May 2013

Allianz Global Investors

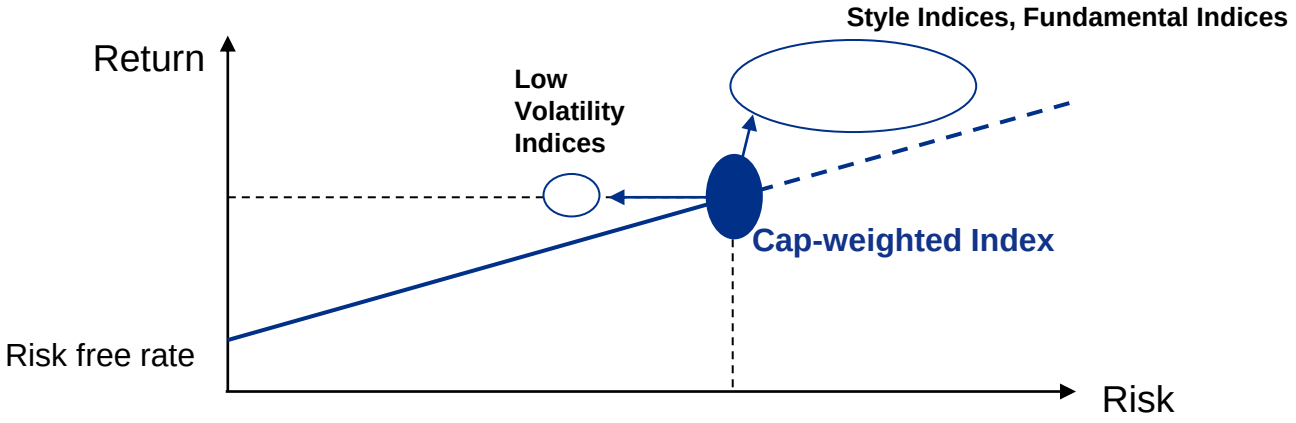
Understand. Act.

Capitalisation Weighted Indices Are Not Efficient

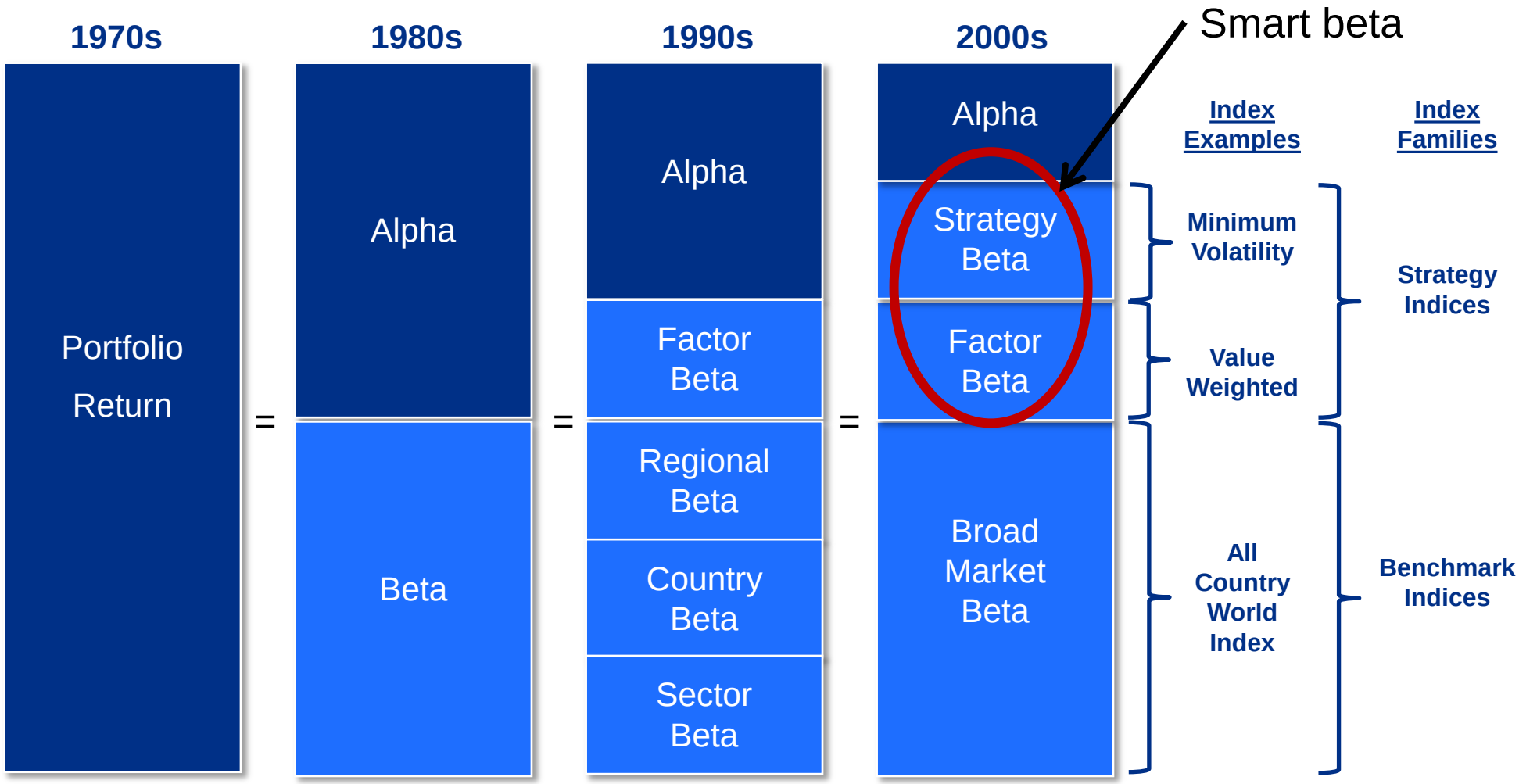
Well Known Anomalies and New Challenges

- The existence of value, momentum and size anomalies are well-known challenges to the efficiency of capitalisation weighted indices.
- Fundamental Indices and Low Volatility Strategies have recently called the efficiency of cap weighted portfolios into question again.
  Both strategies are meant to explore new sources of market inefficiency, valuation noise and the low volatility anomaly.

Capitalisation-weighted indices are not efficient



Today's Alpha is Tomorrow's Beta



Source: MSCI

Smart Beta – what is it?

- As indicated by the previous graph, today, the performance of any asset management product can be broken up into 3 parts
  - Market beta
  - Alpha (as provided by fundamental analysis and stock picking)
  - Smart Beta (exposure to well known market anomalies)
- Smart Beta can be divided up into
  - Factor Beta (value, growth, small caps etc.)
  - Strategy Beta (minimum variance, fundamental indexing, maximum diversification etc.)
- Smart Beta explicitly or inexplicitly accounts for a substantial part of long term portfolio returns
- But currently factor beta and strategy beta are considered separately

➡ QUESTION: what will this chart look like in 2020?

Strategy beta – risk based benchmarks

Strong Market Drawdowns in Recent Years have Triggered Demand for Equity Strategies with Lower Risk

- Two bear markets in a single decade have forced investors to look for less volatile equity products.
- Attractive risk/return profile beyond just being defensive.
  Higher return - over the long run - at (always) lower risk than the market-cap weighted benchmark.
- Equity Strategies with Lower Risk - as recommended by consultants as a core equity investment - might free up risk budget that could be allocated to higher returning strategies
  - in an asset allocation framework
  - in a liability-driven investment strategy
  - in multi-strategy equity funds
- Investors moving away from relative-risk objectives and market-cap weighted indices towards absolute risk objectives and alternative indices.

Managed volatility strategies address the demands of risk conscious equity investors

Managed Volatility in the Focus of Investors, Academics & Consultants

Heightened interest in this strategy from various parties recently

- **Prospects & clients**
  Pension plans
- **Brokers, asset managers & academics**
  Many papers and thought pieces have been written on the theme by Nomura, UBS, Deutsche Bank, Macquarie, GMO, Bernstein and many more
- **Benchmark vendors like MSCI Barra**
  They offer strategy indices e.g. MSCI World Risk Weighted Index or MSCI Global Minimum Volatility
- **Consultants**
  Mercer increasingly recommends low vol strategies to their clients as core investments in order to free up risk budget for satellite strategies.

Investments in managed volatility products have risen significantly – for good reasons

Strong and Rising Demand for Lower Risk Equity Strategies

Recent News flow

Interest among institutional investors does appear to be growing.
Investment consultant **bfinance** in a survey in late January and early February found **37% of 82 institutional investors**, ..., were **considering moving some of their passive assets ... to smart-beta strategies**.

Towers Watson clients **added $3.1 billion to new smart beta strategies** in 2011, down slightly from $3.3 billion in 2010.

That momentum is coming roughly a year or two after a number of investment consultants - including **Mercer, Wilshire Associates, Russell Investments and Segal Rogerscasey - began recommending that clients consider the strategy.**

BlackRock (BLK)'s smart-beta assets **hit $8 billion at the end of 2011, up from just $100 million three years prior**.

Consultants and managers agree that **low volatility is heating up, with demand for active management versions boosted by wild markets** (*P&I*, Aug. 22

State Street Global Advisors' smart beta assets jumped 53% in 2011 to $22.3 billion; that's a five-fold increase from the $4.5 billion run in 2008.

http://www.pionline.com/article/20120319/PRINTSUB/303199989

Low Risk Anomaly

Allianz Global Investors

« *CAPM suggest that higher risk is rewarded with higher returns. Empirically, this does not hold.*

Low risk stocks have long outperformed high risk stocks »

Possible Explanations

- **Behavioral finance**
  Lottery preference: Investors have a preference for low probability, high payout scenarios, therefore they overpay for high beta
- **Index-based investing**
  In the absence of leverage, a portfolio manager who is evaluated vs. a benchmark is incentivized to underweight low beta names and overweight high beta names.
- **Variability of beta**
  In times of large market moves, beta seems to move to 1, allowing for surprisingly good upside participation and less downside protection than expected
- **Low beta shows similarity with call overwriting and therefore earns a call premium**
  - participation in up-markets may be limited
  - in exchange for some (but less than expected) protection in down-markets

➡ **The Low Risk Anomaly is here to stay**

Intense Academic Research on Low Volatility Approaches …

1952	 H. Markowitz	**Modern Portfolio Theory** H. Markowitz's article *Portolio Selection* is published. The concept of minimum variance portfolio is introduced. The article lays the foudation of Modern Portfolio Theory (MPT).
1970	 E. Fama	**Efficient Market Hypothesis** (Eugene Fama): An investment strategy that is based on publicly available information cannot outperform the market on a risk-adjusted basis. From the hypothesis it follows that the risk-adjusted performance of the minimum variance portfolio is not superior.
1970 - 1985 1975 -1990	 Kahneman	**Market Anomalies -** several researchers find counter examples to the Efficient Market Hypothesis such as the Value-Effect or the Size-Effect. **Behavioral Finance: Kahnemann/Tversky, DeBondt/Thaler** Psychological biases explain market anomalies.
1991	 Haugen	**Minimum Variance Anomaly – Outperformance of the minimum variance portfolio in the USA** Haugen/Baker show, that a minimum variance portfolio was able to beat the US market from1973-1989 at lower levels of risk. This contradicts the Efficient Market Hypothesis. Clarke et al. Confirm the result for the time frame 1968-2005.
1995	 Kleeberg	**Minimum Variance Anomaly - Outperformance in Germany, UK, Japan and Canada** Kleeberg shows that minimum variance portfolios in many more countries were able to outperform, at lower levels of risk.

… Picking Up Pace Recently

2006

Clarke

Performance Analysis Minimum Variance-Portfolios
Clarke et al. show that although the minimum variance portfolios benefit from the **Value-Effect** and the **Size-Effect,** the outperformance persists after accounting for the value-effect and the size-effect. Hodrick et al. show that stocks with **low idiosyncratic volatility** can beat the market, helping the minimum variance strategy that is overweight those stocks.

2008

Choueifaty

Toward Maximum Diversification
Choueifaty and Coignard introduce and employ a diversification measure to build a risk-efficient portfolio. Empirical results imply that in the long run, **actively managed** portfolios that **maximize diversification** can achieve consistently better results than commonly used passive index tracking methodologies.

2011

M. Baker

J. Wurgler

Benchmarks as Limits to Arbitrage: Understanding the Low-Volatility Anomaly
Baker, Bradley and Wurgler explore behavioural origins of the minimum variance 'anomaly' and discuss the arbitrage possibility. The authors identify benchmarking as an explanation why institutional investors are discouraged from buying high alpha, low beta stocks.

2011

R. L. de Carvalho

Demystifying Equity Risk-Based Strategies: A Simple Alpha Plus Beta Description
de Carvalho, Lu and Moulin compare five risk-based strategies. Equally-weighted, equal-risk budget and equal-risk contribution are identified to be highly correlated. On the other hand, minimum variance and maximum diversification are described as being more defensive strategies.

2011

H. de Silva

S. Thorley

Minimum Variance Portfolio Composition
Clarke, de Silva and Thorley derive a solution for optimal portfolio weights in a minimum variance portfolio. The analytic and empirical results suggest that minimum variance portfolio performance is largely a function of the empirical critique of the traditional CAPM that low beta stocks have relatively high average returns.

Concepts to Reduce Volatility

Equity volatility can be managed in several ways

Strategy	Description	Relative Perf vs. Market p.a.	Beta	Volatility Reduction vs Market	Tracking Error
Equal Weighted Portfolio	Each stock assumes the same weight	3.6%	0.96	1%	5.1%
Equal Risk Budget Portfolio	Each stocks is weighted in proportion to the inverse of volatility	3.8%	0.87	-9%	5.4%
Equal Risk Contribution Portfolio	Each stocks contributes the same to the portfolio risk	3.5%	0.81	-18%	6.6%
Maximum Diversification	The maximum diversification portfolio maximizes the diversification ratio *average stock volatility / portfolio volatility*	2.6%	0.48	-36%	12.1%
Minimum Variance	The minimum variance portfolio is the portfolio with lowest possible variance	3.1%	0.39	-45%	13.1%

Source: de Carvalho, Lu, Moulin: Demystifying Equity Risk Based Strategies, 2011.

A Word of Caution on Unconstrained Minimum Variance Strategies

Unconstrained concepts face risks of concentration and estimation error

- Minimum Variance is the most attractive of the low risk strategies as the strategy offers the highest volatility reduction with similar performance than the other strategies.

- However, unconstrained Minimum Variance portfolios are low breadth portfolios with a high tracking error around 15% versus a cap weighted benchmark. Stocks are selected only based on the estimated covariance matrix in a quadratic optimization that is known to be biased towards stocks with high estimation errors in the covariance matrix.

  Investment decisions are hard to communicate to clients given that investment decisions are just based on the covariance matrix. This might be unsatisfying for clients if a position turns sour.

- The MSCI Minimum Volatility index is an example of a constrained Minimum Variance strategy.
  - The MSCI Minimum Volatility index offers a lower tracking error of 6% vs. the MSCI Index and a broader diversification with ~250 stocks.
  - Managing low volatility products vs. a widely accepted low volatility benchmark might replace the currently prevailing benchmark-free minimum variance portfolios.

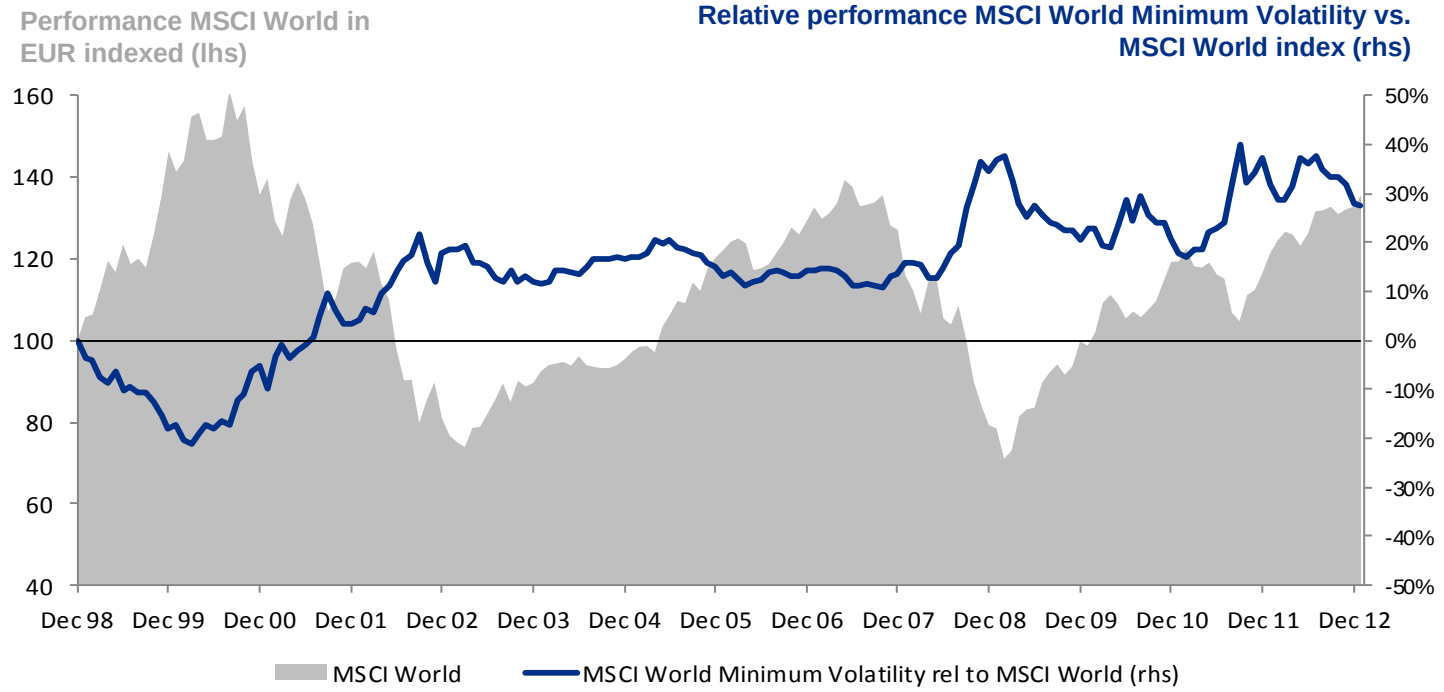
Managing risks by constraining minimum variance strategies

Low Volatility Strategies: Outperformance at Lower Levels of Risk

Managed volatility outperforms in down markets and keeps up in rising markets

- Lower Risk Equity strategies like Minimum Variance Strategies have generated an attractive outperformance at lower levels of risk than the index
- Minimum Variance Strategies - unsurprisingly - have beaten the market in down-markets, but also managed to cope with rising markets most of the time.

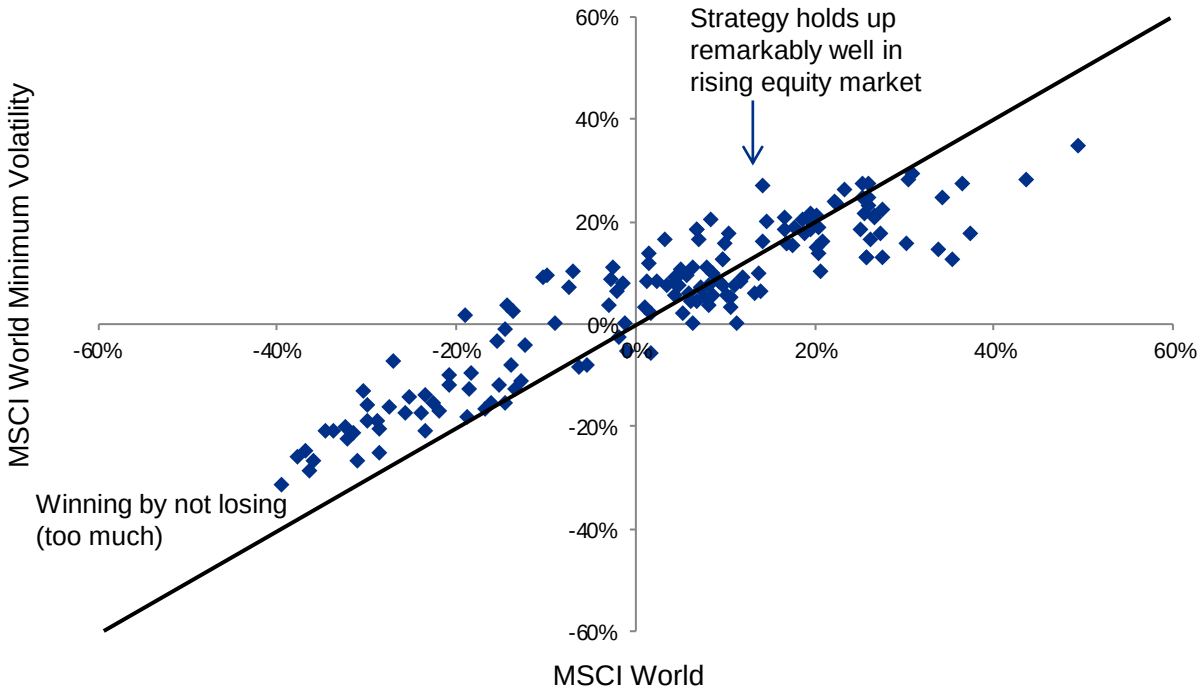
Relative Performance MSCI World Minimum Volatility vs. MSCI World Index



Source: MSCI as of 31 January 2013

Low Volatility Strategies Benefit from Variable Beta

MSCI World Minimum Volatility vs. MSCI World Index



Source: AllianzGI, MSCI, 1999-2013

In strong up and strong down markets beta tends to move to 1.

What Drives The Performance Of the MSCI Minimum Volatily Strategy?

- Anecdotal evidence for the MSCI Minimum Volatility Strategy

  - **Sector Allocation**
    The Minimum Variance Strategy got the two major sector calls of the last 2 decades right - underweighting IT around 2000 and selling Financials in 2006.
  - **Regional Allocation**
    The Minimum Variance Strategy got the one major regional call within developed markets right - underweighting Japan in the early 90s.
  - **Investment Styles Exposure**
    Performance contributions from investment styles value, momentum and small caps minor on average, but highly varying exposures that should be managed.

Strategy beta – risk based benchmarks

Performance Drivers of Low Volatility Strategies

Many market drivers are well-known, but low risk anomaly is a separate phenomenon

- The performance of low volatility strategy indices can be explained fully by the exposures to well-known risk factors or market anomalies like
  - Market exposure
  - Value
  - Growth
  - Small cap
  - Momentum
  - Low risk anomaly

There is no alpha statistically different from zero left after accounting for these well-known risk factors.

Strategy	Relative Performance Drivers
Equal Weighted Portfolio	Small Caps, Value
Equal Risk Budget Portfolio	Small Caps, Value, Lower Risk Anomaly
Equal Risk Contribution Portfolio	Low Risk Anomaly, Small Caps, Value, Lower Market Exposure*
Maximum Diversification	Low Risk Anomaly, Lower Market Exposure
Minimum Variance	Low Risk Anomaly, Lower Market Exposure

*** black and green ink: added to performance**
blue ink: detracted

Source: Carvalho, Raul Leote de , Xiao, LU and Moulin, Pierre, Demystifying Equity Risk-Based Strategies: A Simple Alpha Plus Beta Description

Style investing against risk based benchmarks

- Minimum variance type benchmarks seem to be the most probable candidates for an industry standard, due to their firm base in academic literature, widespread use of minimum variance optimization using risk models and optimizers
- Minimum Variance benchmarks are offered by large index providers like MSCI
- Minimum Variance seems to realize its superior (compared to market cap) characteristics without significant (constant) exposures to classical risk factors like value and momentum

➡ We expect a significant portion of assets to be benchmarked against Minimum Variance benchmarks

- In a risk return framework risk based strategies and the more classical style factors offer similar levels of improvement over the market capitalization based indices.

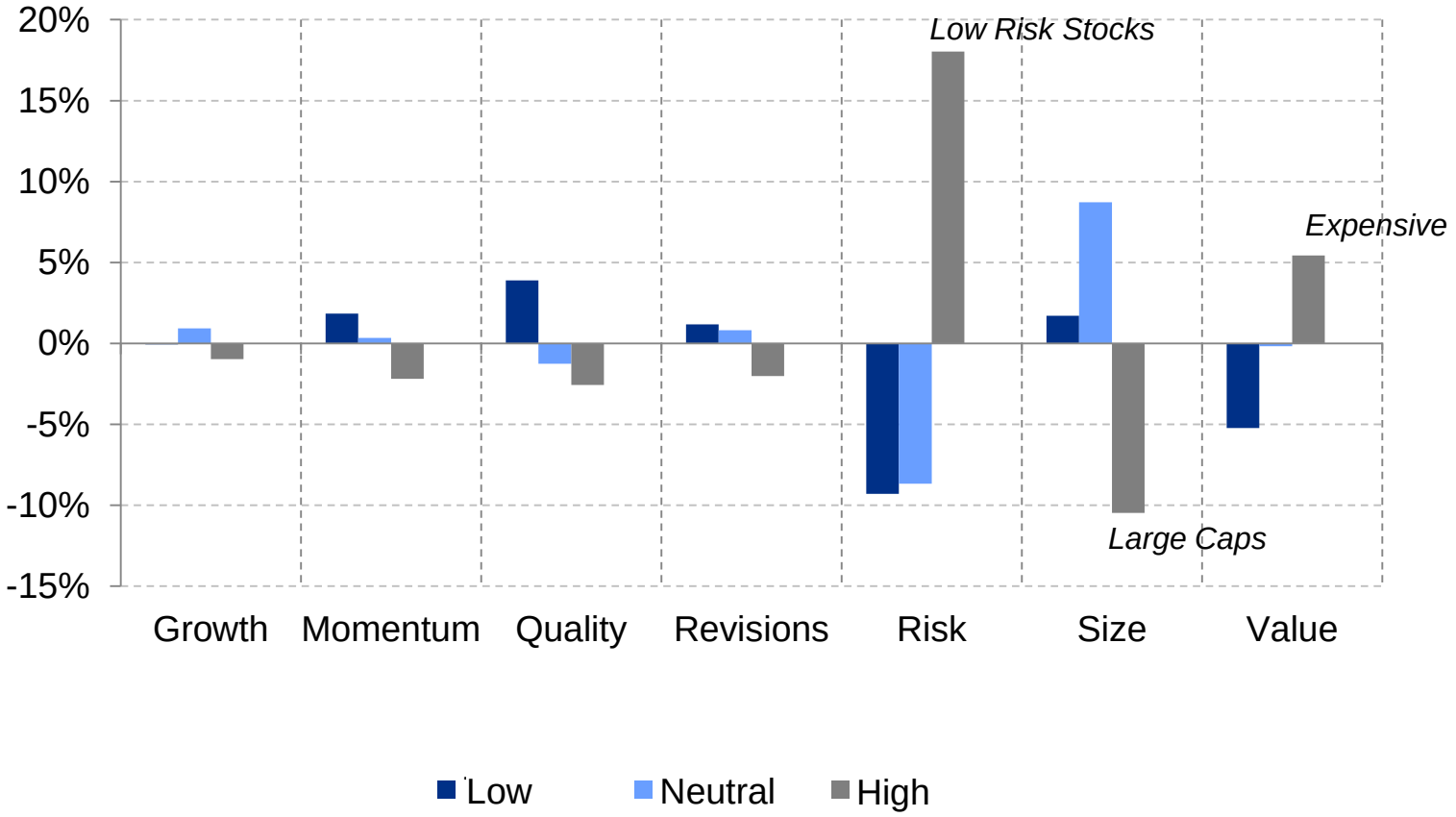
➡ Can we form portfolios which preserve the attractive features of risk based benchmarks but at the same time outperform these?

Case study – Diversified Style portfolio against MSCI Emerging Markets Minimum Volatility

Diversified Style portfolio against MSCI EM MIN VOL Setup

- For the case study presented here 10 years of constituents data for the MSCI Minimum Volatility Benchmarks for both Europe and Emerging Markets are used. The data has been kindly provided by MSCI
- Due to high interest in the region of emerging markets, the attractive features of Minimum Volatility and the widespread use of the index provider, we concentrate on MSCI Emerging Markets Minimum Volatility (MSCI EM MIN VOL) as a benchmark
- An extensive list of classical factors from our comprehensive global factor database was tested against the Minimum Volatility benchmarks
- We wanted to see if the attractive features of a MinVol benchmark can be preserved and an outperformance against the risk based benchmark can be achieved at the same time
- First step: check if the characteristics mentioned before hold for emerging markets

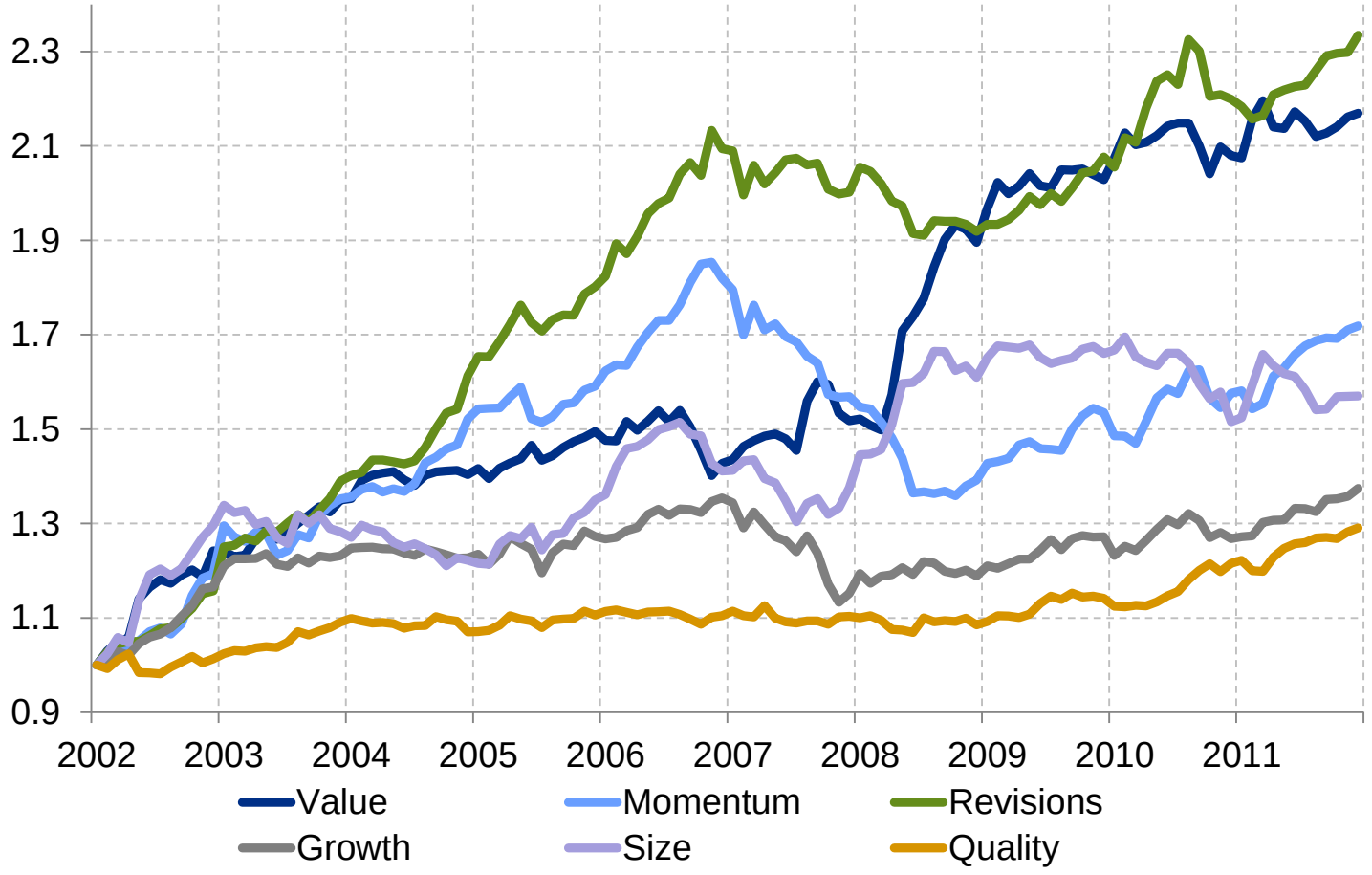
Average style tilts of MSCI EM MIN VOL vs. MSCI EM



All stocks at each point in time in the period considered are assigned to either the low, neutral or high basket according to a certain investment-style score. In the chart shown is the average over time of the difference in cumulative weight of the strategy vs. the benchmark.

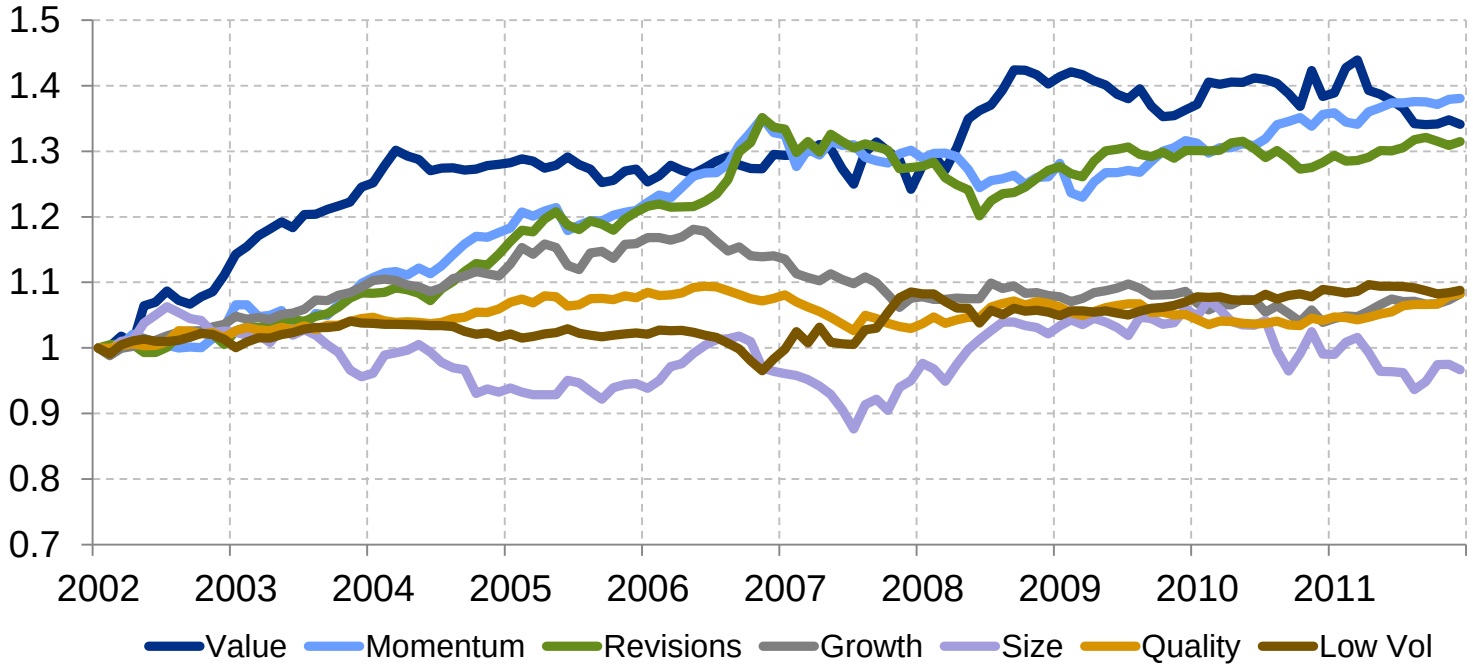
Also in EM style tilts are small with the exception of risk and size as expected. A clear tilt to low risk as well as a tilt away from large caps are present. A small underexposure to value is also visible.

Performance of Investment Styles vs. MSCI EM



All stocks in the benchmark are assigned scores which represent attractiveness according a certain investment style like value. We define the 20% most attractive stocks to form the Investment style portfolio. We regularly examine various ways to construct portfolios which represent investment styles but for the sake of simplicity and since the general statement is not changed by choosing a different method to construct the style portfolios we follow this simple method here.

Performance of Min Vol Investment Styles* vs. MSCI EM MIN VOL



* Min Vol Investment Style follow the same methodology described on the previous page, but in addition require all stocks to be members of the MSCI EM MIN VOL benchmark.

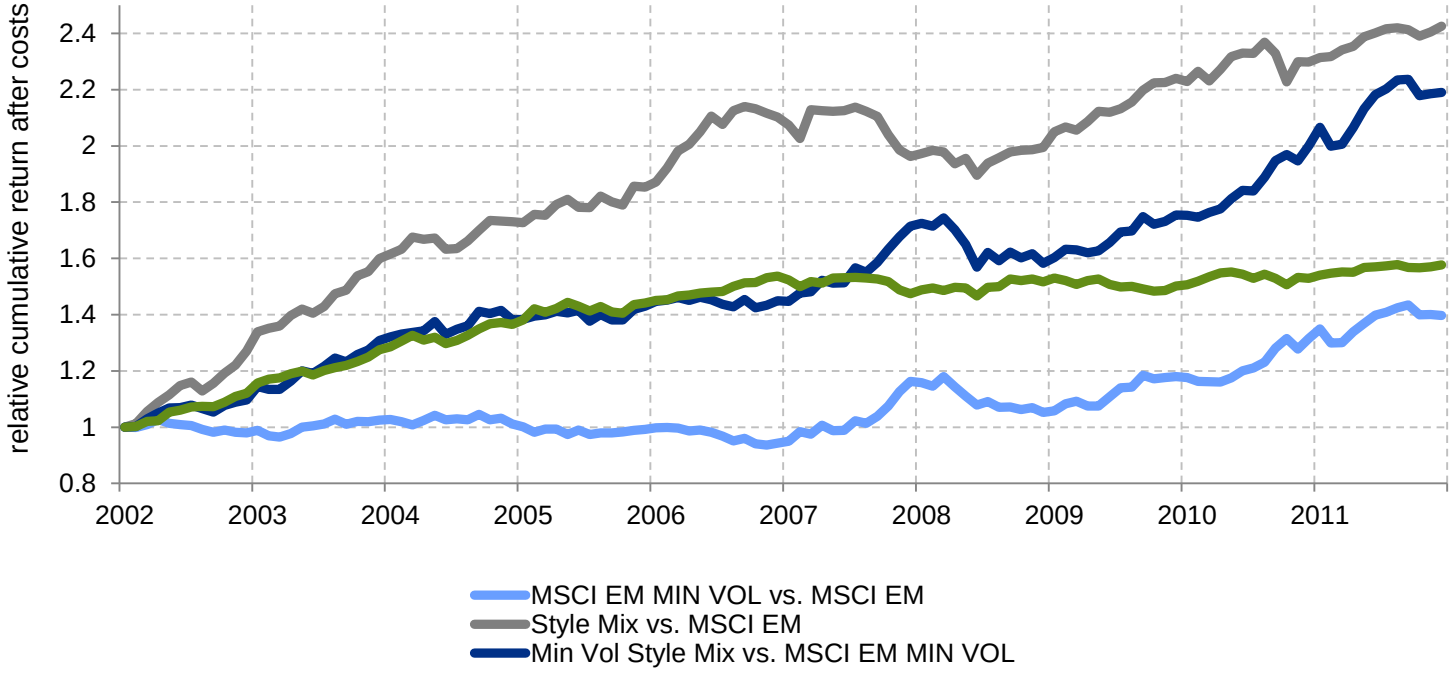
Strategy	Benchmark	Return p.a. (after costs)	Benchmark Return	Relative Return (after costs)	Information Ratio (after costs)	Tracking Error	Beta	Volatility	Benchmark Volatility	Return over Volatility
Momentum	MSCI EM MIN VOL	21.5%	18.6%	2.9%	0.74	4.0%	1.06	17.8%	16.4%	1.21
Revisions	MSCI EM MIN VOL	20.9%	18.6%	2.4%	0.65	3.6%	1.09	18.3%	16.4%	1.15
Value	MSCI EM MIN VOL	21.4%	18.6%	2.9%	0.58	5.0%	1.06	18.0%	16.4%	1.19
Quality	MSCI EM MIN VOL	19.0%	18.6%	0.5%	0.21	2.1%	1.03	17.1%	16.4%	1.11
Low Vol	MSCI EM MIN VOL	19.2%	18.6%	0.6%	0.21	2.9%	0.91	15.2%	16.4%	1.26
Growth	MSCI EM MIN VOL	19.0%	18.6%	0.4%	0.14	3.1%	1.06	17.7%	16.4%	1.07
Size	MSCI EM MIN VOL	17.2%	18.6%	-1.4%	-0.25	5.8%	0.97	16.9%	16.4%	1.01

Performance of Min Vol Investment Styles vs. MSCI EM MIN VOL

- The Min Vol flavors of value, revisions and momentum do well against the MIN VOL benchmark, with information ratios between 0.6 and 0.8. This is comparable to the performance of the corresponding non Min Vol flavors against the broad benchmark
- Size, Quality and Growth barely add to performance, despite all of their them having positive performance against the broad benchmark over the time period
- Low Volatility as a factor barely adds to performance since building a meaningful low volatility exposure against a MIN VOL benchmark is difficult. The existing small outperformance is due to the fact that the MSCI Minimum Volatility benchmark, because of it‘s constraints, does not exploit the full potential of volatility reduction

Classical factors like value, revisions and momentum are promising candidates for a style strategy benchmarked against a MIN VOL benchmark

Performance of a Diversified Style Strategy in Emerging Markets with and without MIN VOL



In order to investigate the possibility to manage an investment style based approach against a MIN VOL benchmark, we constructed a combination of value, momentum and revisions factors to represent a core portfolio invested in a diversified mix of styles. No fitting of factors has been done, instead a mix we use in several places of our research has been used.

Strategy	Benchmark	Return p.a. (after costs)	Benchmark Return	Relative Return (after costs)	Information Ratio (after costs)	Tracking Error	Beta	Volatility	Benchmark Volatility	Sharpe Ratio*	Benchmark Sharpe Ratio*
MSCI EM MIN VOL	MSCI EM	18.4%	14.7%	3.8%	0.63	6.0%	78.2%	16.4%	20.4%	1.13	0.72
Style Mix	MSCI EM	21.9%	14.7%	7.2%	1.20	6.0%	107.0%	22.6%	20.4%	1.12	0.72
Min Vol Style Mix	MSCI EM	23.4%	14.7%	8.7%	1.45	6.0%	84.2%	17.9%	20.4%	1.35	0.72
Min Vol Style Mix	MSCI EM MIN VOL	23.4%	18.6%	4.8%	1.35	3.6%	107.2%	17.9%	16.4%	1.35	1.13

* For sharpe ratio calculations the risk free rate was assumed to be 0.

Performance of a Diversified Style Strategy in Emerging Markets with and without MIN VOL

- The chart shows the relative cumulative performance of three strategies (MSCI EM MIN VOL, Style Mix and Min Vol Style Mix) vs. the respective benchmark.
- The strategies Style Mix and Min Vol Style Mix combine value, momentum and revisions using the same factors and weights. Min Vol Style Mix, in addition, requires all stocks to be members of the MSCI EM MIN VOL.
- The strategy Min Vol Style Mix delivers an attractive outperformance vs. MSCI EM MIN VOL, with a realized information ratio of 1.35 after costs at a core tracking error of 3.6% from 2002-2012
  - MSCI EM MIN VOL reduces absolute volatility by 4% points compared to MSCI EM
  - Most of this reduction is preserved when using the Min Vol Style Mix strategy, reducing volatility by 2.5% points from 20.4% (MSCI EM) to 17.9% (Min Vol Style Mix).
  - Min Vol Style Mix realized a sharpe ratio of 1.30 after costs compared to 0.72 for the MSCI EM
  - The diversified style strategy on a the broad benchmark yields a sharpe ratio of 0.97 after costs over the same time period.

Performance of a Diversified Style Strategy in Emerging Markets - Maximum Drawdowns

- An important aspect of the attractiveness of Min Vol strategies is the reduction of maximum drawdowns
- The two biggest drawdowns for the MSCI EM between 2003 and 2012 occurred from Nov 07 – Feb 09 with -55% and Jan 11 – Oct 11 with -22%
- MSCI EM MIN VOL suffered only -44% and -13%, 11pp and 9pp less than the broad benchmark
- Using the strategy Style Mix worsened the behavior, adding 5 and 2 pp to the drawdown leading to -60% and -24%
- Despite that, Min Vol Style Mix two worst drawdowns were only -46% and -14%, thereby 9 and 8pp more than the broad market, conserving much of the advantage

Strategy	Benchmark	From	To	Absolute Return (after cost	Relative Return (after cost	Benchmark Return	Drawdown
MSCI EM	MSCI EM	2007-10-31	2009-02-28	-55.47%	-0.07%	-55.40%	worst
MSCI EM MinVol	MSCI EM	2007-10-31	2009-02-28	-43.94%	11.46%	-55.40%	worst
Style Mix	MSCI EM	2007-10-31	2009-02-28	-60.15%	-4.75%	-55.40%	worst
Min Vol Style Mix	MSCI EM	2007-10-31	2009-02-28	-46.02%	9.38%	-55.40%	worst
Min Vol Style Mix	MSCI EM MinVol	2007-10-31	2009-02-28	-46.02%	-2.26%	-43.76%	worst
MSCI EM	MSCI EM	2010-12-31	2011-09-30	-21.93%	-0.03%	-21.90%	second
MSCI EM MinVol	MSCI EM	2010-12-31	2011-09-30	-12.72%	9.18%	-21.90%	second
Syle Mix	MSCI EM	2010-12-31	2011-09-30	-23.98%	-2.08%	-21.90%	second
Min Vol Style Mix	MSCI EM	2006-04-30	2006-06-30	-14.08%	-1.96%	-12.12%	second
Min Vol Style Mix	MSCI EM MinVol	2006-04-30	2006-06-30	-14.08%	-1.91%	-12.17%	second

Conclusions

- **Benchmarking**
  - We expect **risk based** benchmarks to become the default benchmark for a relevant part of core equity assets
  - **Minimum Volatility** offers attractive features which could make it the benchmark of choice, especially in a multi asset context
  - **Unconstraint Minimum Volatility** has drawbacks, like heavy concentration, high turnover, high sensitivity to details of the risk model (covariance matrix)
  - We expect a **constraint Minimum Volatility** benchmark to be favored
- **Style investing vs. Min Vol Benchmarks**
  - **Style tilts** are implicit in risk benchmarks and small on average but are important performance drivers.
  - Management of **investment styles vs. e.g. a minimum volatility benchmark** is promising

Conclusions

- Over the period from 2003-2012 a **diversified style portfolio** on a minimum volatility universe would have **outperformed MSCI EM MIN VOL** preserving most of the attractive features of such a benchmark
- Most **investment styles** do contribute positively.
- Despite the MSCI EM MIN VOL being constraint and therefore not realising the full volatility reduction **volatility as a factor** is not able to contribute significantly to performance
- Due to a significant tilt already present in the MSCI EM MIN VOL, a **small cap tilt** does not contribute positively

- **Managing investment styles** against a Min Vol benchmark is adding significant value over tracking Min Vol benchmarks

- A product which **combines both minimum volatility and the classical style factors** should be the choice for asset owners interested in owning a low volatility portfolio

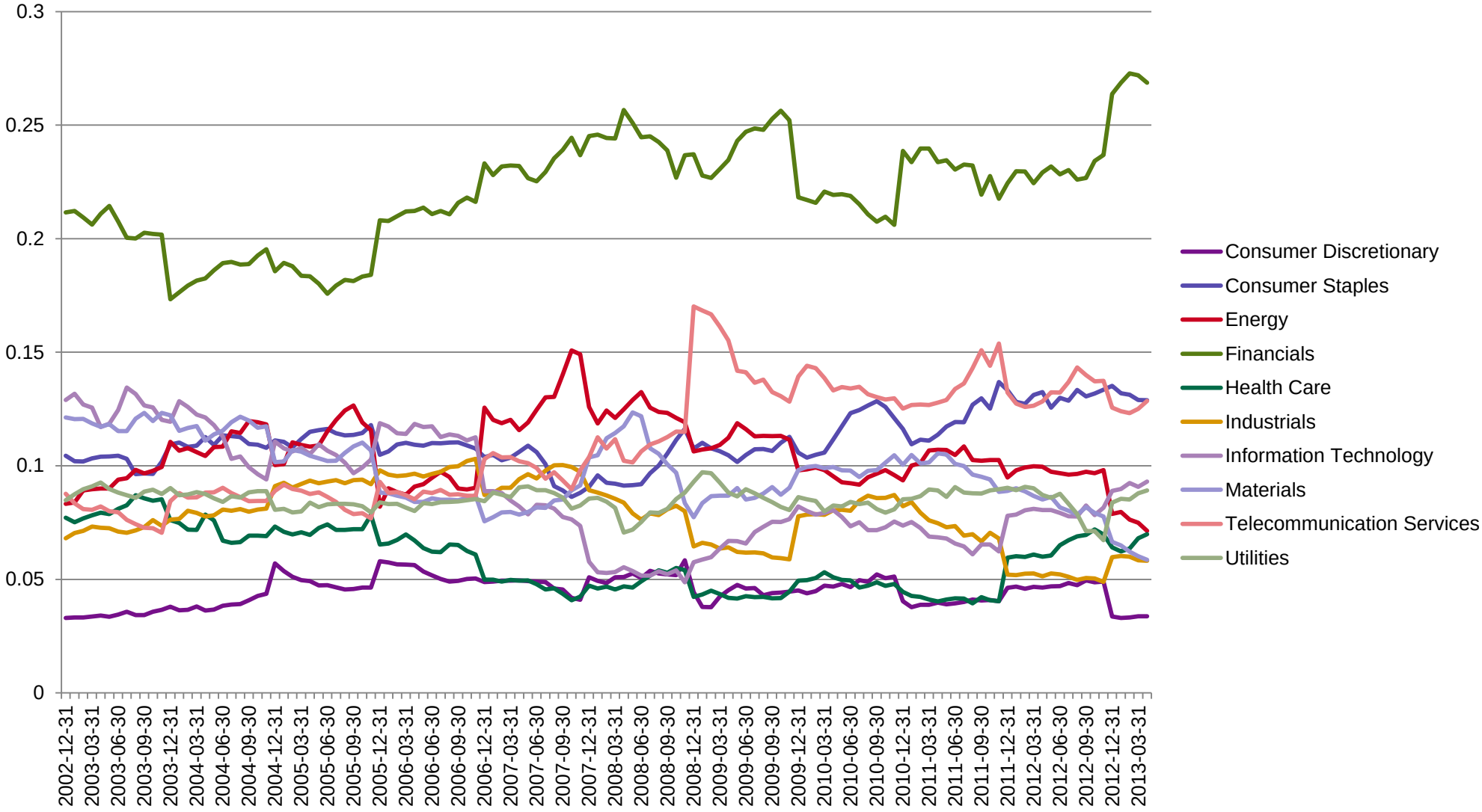
Thank you for your attention

Allianz Global Investors

Understand. Act.

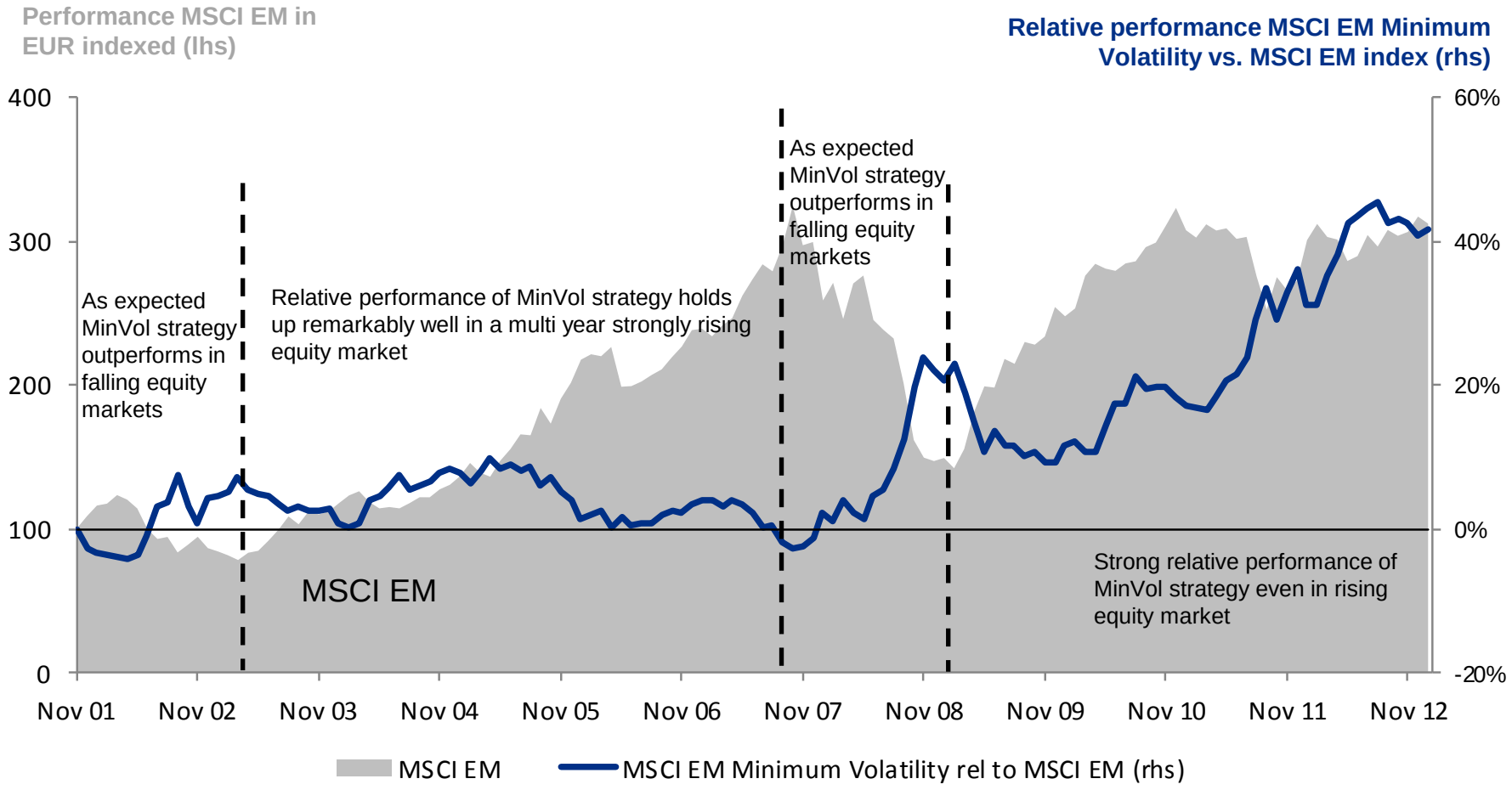
Appendix - MSCI Emerging Markets Minimum Volatility

Sector exposures – MSCI Emerging Markets Minimum Volatility



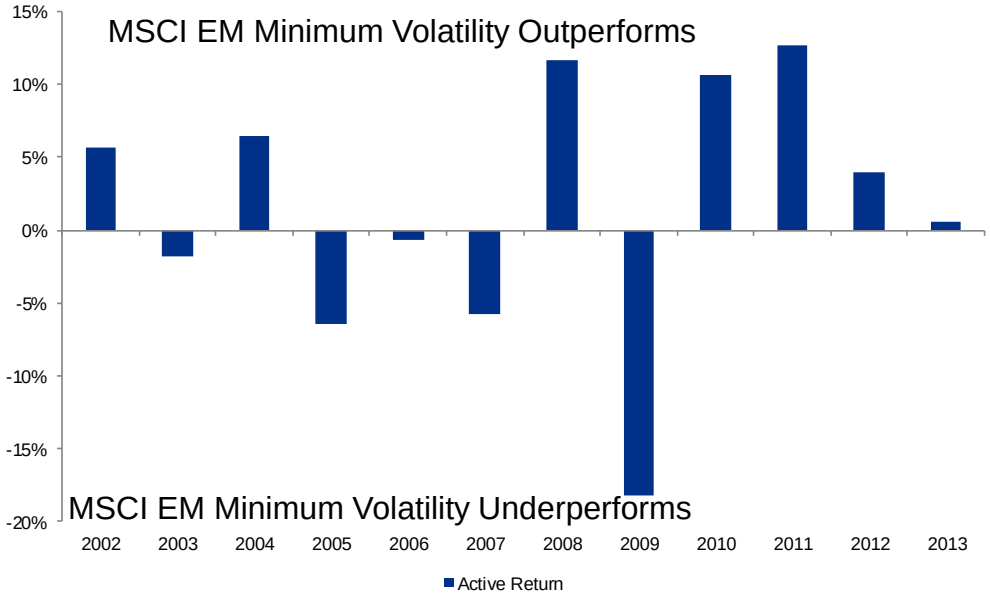
Minimum Volatility Strategy Outperforms MSCI Emerging Markets

Relative Performance MSCI EM Minimum Volatility vs. MSCI EM Index



Source: AllianzGI, MSCI, as of 31 January 2013

Relative Performance MSCI Emerging Markets MinVol vs. MSCI Emerging Markets

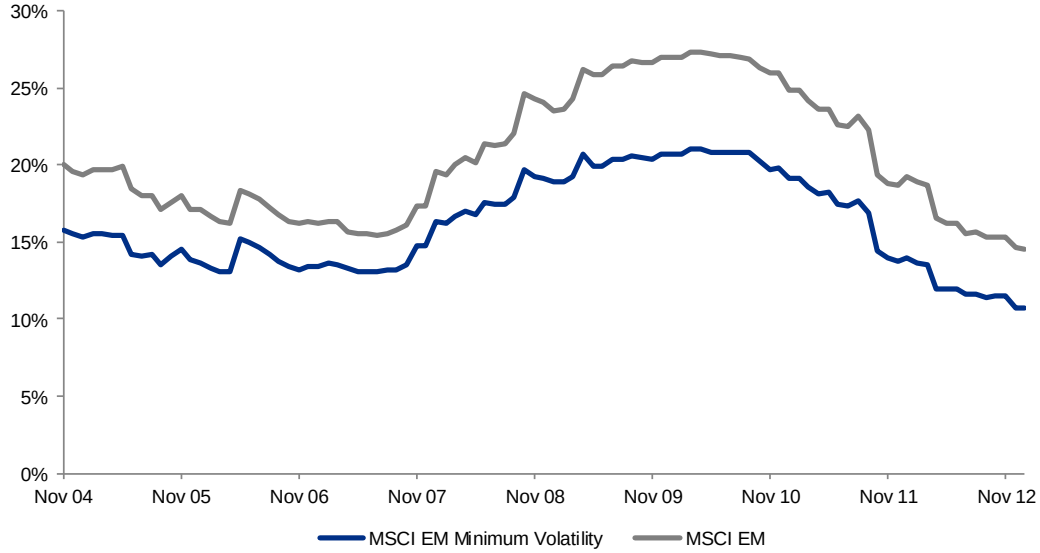


Returns as of 31 January 13			
	MSCI EM Minimum Volatility	**MSCI EM index**	**Active Return**
1 year	12.1%	3.8%	8.3%
3 years p.a.	17.0%	8.0%	8.9%
5 years p.a.	10.8%	3.8%	7.0%
7 years p.a.	10.4%	5.3%	5.1%
10 years p.a.	17.5%	14.0%	3.5%

Source: AllianzGI, MSCI

Significantly Lower Volatility – Always

36 months rolling volatility annualized



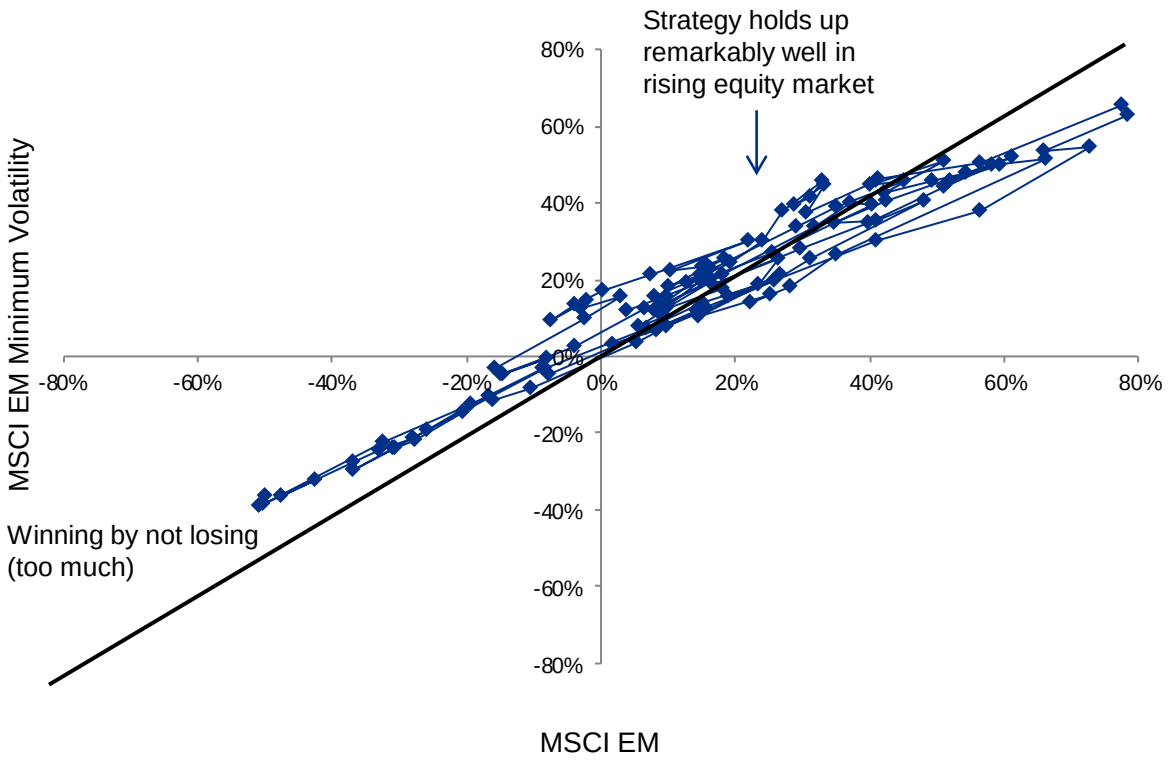
Volatility as o 31 January 13

	MSCI EM Minimum Volatility	MSCI EM index	Reduction
1 year	7.8%	10.6%	-2.8%
3 years p.a.	10.7%	14.6%	-3.9%
5 years p.a.	16.3%	21.7%	-5.4%
7 years p.a.	16.2%	20.9%	-4.6%
10 years p.a.	15.7%	20.1%	-4.4%

Source: AllianzGI, MSCI

12 Months Trailing Performance in EUR – Visualizing Low Beta

MSCI EM Minimum Volatility vs. MSCI EM Index

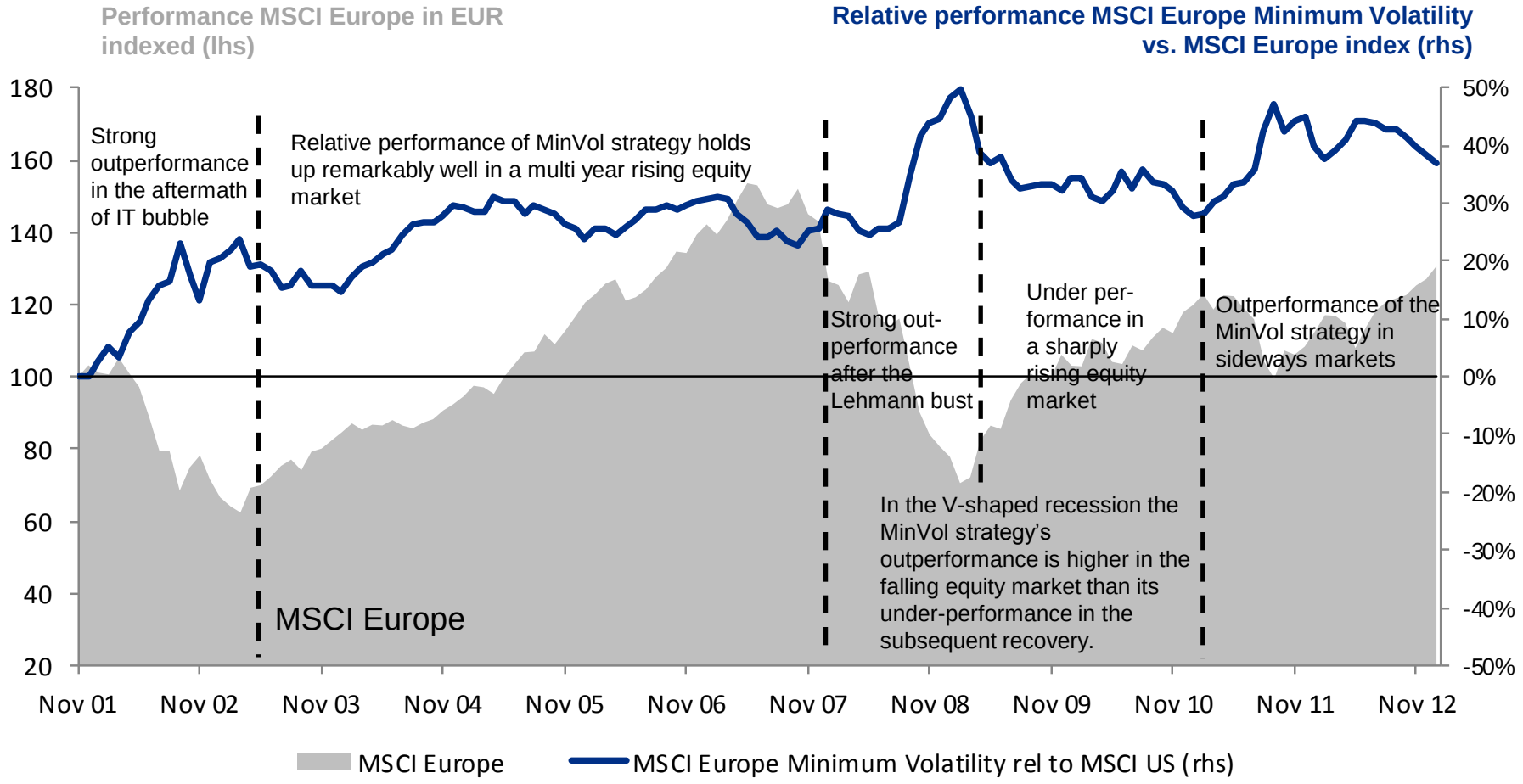


Source: AllianzGI, MSCI, 2002-2013

Appendix - MSCI Europe Minimum Volatility

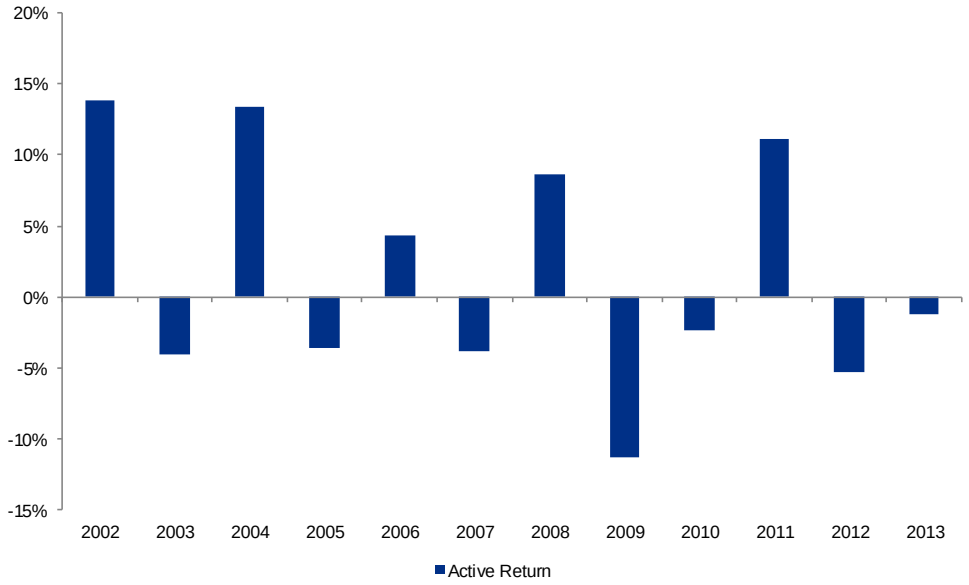
Minimum Volatility Strategy Outperforms MSCI Europe In Down-Markets, Holds Up Well In Up-Markets

Relative Performance MSCI Europe Minimum Volatility vs. MSCI Europe Index



Source: AllianzGI, MSCI, as of 31 January 2013

Relative Performance MSCI Europe Min Vol vs. MSCI Europe



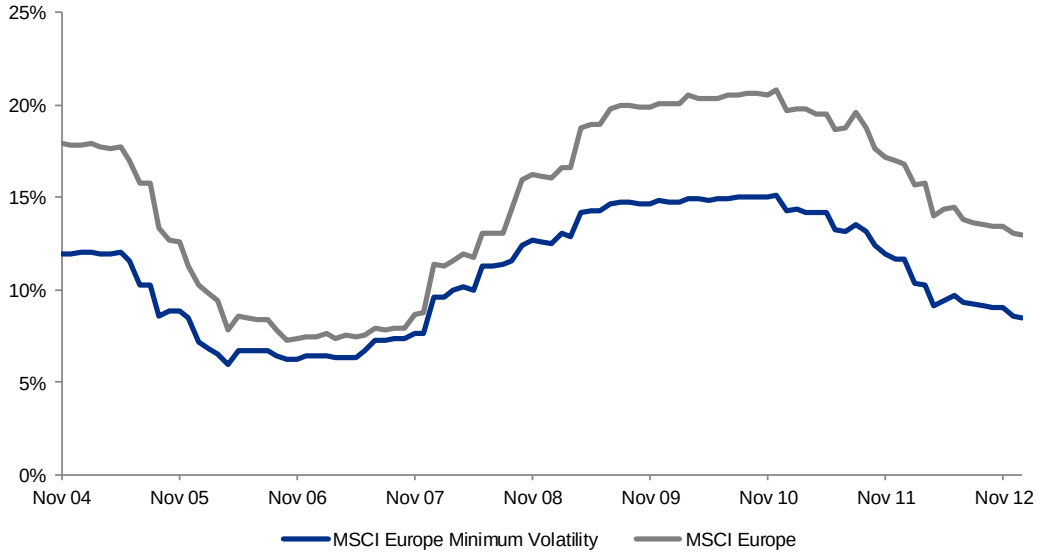
Returns as of 31 January 13

	MSCI Europe Minimum Volatility Index	MSCI Europe Index	Active Return
1 year	13.8%	16.1%	-2.4%
3 years p.a.	9.0%	8.2%	0.7%
5 years p.a.	1.8%	0.6%	1.2%
7 years p.a.	2.6%	1.2%	1.5%
10 years p.a.	8.3%	7.0%	1.4%

Source: AllianzGI, MSCI

Significantly Lower Volatility – Always

36 months rolling volatility annualized



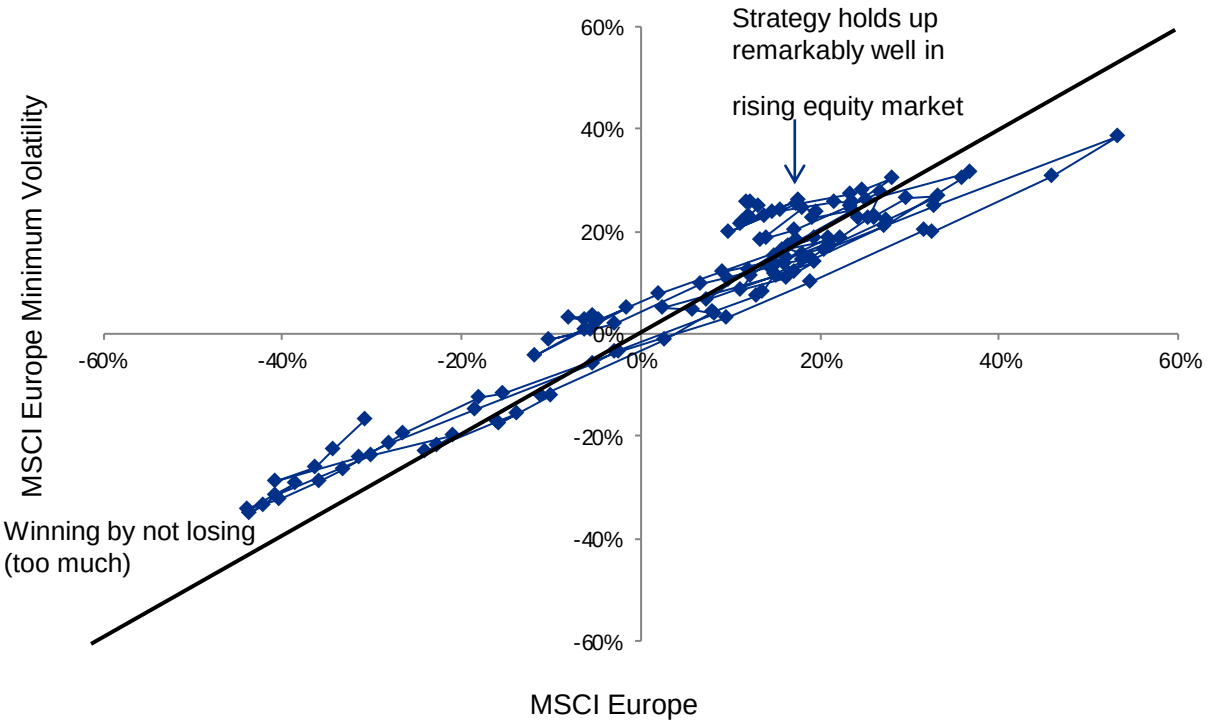
Volatility as o 31 January 13

	MSCI Europe Minimum Volatility Index	MSCI Europe Index	Reduction
1 year	7.3%	10.0%	-2.7%
3 years p.a.	8.5%	13.0%	-4.5%
5 years p.a.	12.4%	17.5%	-5.1%
7 years p.a.	11.9%	16.2%	-4.3%
10 years p.a.	10.9%	14.8%	-3.9%

Source: AllianzGI, MSCI

12 Months Trailing Performance in EUR – Visualizing Low Beta

MSCI Europe Minimum Volatility vs. MSCI Europe Index



Source: AllianzGI, MSCI, 2002-2013

Appendix - Disclaimer

Disclaimer

Investing involves risk. The value of an investment and the income from it may fall as well as rise and investors may not get back the full amount invested.

Past performance is not a reliable indicator of future results. If the currency in which the past performance is displayed differs from the currency of the country in which the investor resides, then the investor should be aware that due to the exchange rate fluctuations the performance shown may be higher or lower if converted into the investor's local currency.

Back-testings and hypothetical or simulated performance data has many inherent limitations only some of which are described as follows:

i. It is designed with the benefit of hindsight, based on historical data, and does not reflect the impact that certain economic and market factors might have had on the decision-making process, if a client's portfolio had actually been managed. No back-testings, hypothetical or simulated performance can completely account for the impact of financial risk in actual performance.

ii. It does not reflect actual transactions and cannot accurately account for the ability to withstand losses.

iii. the information is based, in part, on hypothetical assumptions made for modeling purposes that may not be realized in the actual management of portfolios.

No representation or warranty is made as to the reasonableness of the assumptions made or that all assumptions used in achieving the returns have been stated or fully considered. Assumption changes may have a material impact on the model returns presented. The back-testing of performance differs from actual portfolio performance because the investment strategy may be adjusted at any time, for any reason.

Investors should not assume that they will experience a performance similar to the back-testings, hypothetical or simulated performance shown. Material differences between back-testings, hypothetical or simulated performance results and actual results subsequently achieved by any investment strategy are possible.

The views and opinions expressed herein, which are subject to change without notice, are those of the issuer and/or its affiliated companies at the time of publication. The data used is derived from various sources, and assumed to be correct and reliable, but it has not been independently verified; its accuracy or completeness is not guaranteed and no liability is assumed for any direct or consequential losses arising from its use, unless caused by gross negligence or willful misconduct. The conditions of any underlying offer or contract that may have been, or will be, made or concluded, shall prevail.

Appendix – The Systematic Equities Team at Allianz Global Investors

Systematic Portfolio Management & Research Team

Allianz Global Investors Systematic Equity Team – Professional Experience

Dr. Klaus Teloeken
PhD in Mathematics
Co-CIO Systematic Equity
since 2001
Industry experience since 1996

Dr. Benedikt Henne, CFA
PhD in Mathematics
Co-CIO Systematic Equity
since 2001
Industry experience since 1998

Dr. Rainer Tafelmayer
PhD in Physics
Portfolio manager Best Styles
Global since 2006
Industry experience since 1995

Dr. Magnus Weis
PhD in Physics
Portfolio manager Best Styles
Global since 2008
Industry experience since 2001

Dr. Michael Heldmann, CFA
PhD in Physics
Portfolio manager Best Styles
Global/Europe since 2007
Industry experience since 2007

Rohit Ramesh
Master in Economics & Management
Portfolio manager Emerging
Markets since 2009
Industry experience since 2007

Karsten Niemann, CFA
Master in Economics
Portfolio manager High Dividend
Europe since 2003
Industry experience since 1998

Dr. Kai Hirschen, CFA
PhD in Mathematics
Portfolio manager
High Dividend Global since 2010
Industry experience since 2005

Dr. Andreas Domke, CFA
PhD in Physics
Portfolio manager Best Styles
Euroland since 2007
Industry experience since 2000

Erik Mulder, CFA
Master in Business Administration
Portfolio manager Best Styles
Europe since 2008
Industry experience since 1999

Georg Elsaesser
Master in Business Mathematics
Product specialist Systematic
Equity since 2012
Industry experience since 1999

Stable and experienced global equity management team

Source: Allianz Global Investors as at February 2013