

THE MSCI MINIMUM VOLATILITY INDEXES: 10 YEARS ON

Insight from 10 Years of Live Indexes

Mehdi Alighanbari and Shubhangi Sharma

December 2018

CONTENTS

| | |
|--|----|
| Introduction..... | 3 |
| A Ten-Year Journey | 4 |
| Behavior of the Index: Live versus Backtesting | 4 |
| Minimum Volatility Indexes: Frequently Asked Questions..... | 8 |
| Q1: Why did you choose an optimization approach to construct the low-volatility indexes? | 8 |
| Q2: What are the potential benefits of using multi-factor models for index construction? | 8 |
| Q3: Why should correlation be considered when creating a low-volatility index? | 9 |
| Q4: How do constraints help construct an investable Minimum Volatility Index? | 9 |
| Q5: Why is turnover constrained? | 9 |
| Q6: Does the turnover constraint create path dependency? What is the impact?..... | 10 |
| Q7: With more AUM tracking the Minimum Volatility Indexes, could valuation become an issue? | 10 |
| Q8: Are the Minimum Volatility Indexes running out of capacity? | 10 |
| Q9: Can ESG be incorporated into a Minimum Volatility Index? How?..... | 11 |
| Q10: What is the Low-Volatility Factor Premium? | 11 |
| Q11: What does base currency in optimization mean and why is it important? | 11 |
| Q12: Have the characteristics of the MSCI Minimum Volatility Indexes changed since their launch in 2008? | 12 |
| Q13: What do rising interest rates mean for minimum volatility strategies? | 12 |
| Q14: What about approaches to mitigate other dimensions of risk? | 13 |
| Q15: Has Minimum Volatility maintained its characteristics in narrower markets? | 13 |
| Conclusions..... | 14 |
| References..... | 15 |

INTRODUCTION

2018 marked the 10-year anniversary of the MSCI Minimum Volatility Indexes. The indexes were among the first factor indexes launched by MSCI. The timing of the launch, just prior to the global financial crisis that led to sharp equity market falls, and the indexes' behavior "out-of-sample" since launch, have driven wide adoption by a large number of asset owners as part of their "defensive equity" allocation strategies. The indexes have also been the basis for a wide range of exchange traded funds (ETFs), which have gathered very significant assets in recent years.

Over the past 10 years, we have addressed many client questions on the construction of the indexes, including why we chose the parameters we did and the indexes' behavior, especially in times of market selloffs. To help answer some of these questions, in 2016 we wrote "Constructing Low Volatility Strategies."¹ We explained how the different elements of the methodology affected index behavior and the rationale behind incorporating these elements via the use of constraints. In 2017, in "Managing Risk beyond Volatility,"² we analyzed diversification, valuations, crowding and ESG in relation to the MSCI Minimum Volatility Indexes, showing how each could be embedded without compromising the core objectives of the indexes. Most recently, in "The Capacity of Factor Index Strategies: Assessment and Control,"³ we looked at the important question of the capacity of funds tracking factor indexes, with a particular focus on the MSCI Minimum Volatility Indexes.

In this paper, we first review the MSCI Minimum Volatility Indexes and contrast the past 10 years of live data with the previous 10 years of backtesting. At launch, many investors focused on the use of optimization in index construction – but over the intervening 10 years, the focus has shifted to the indexes' outturn: the delivery of low volatility in successive crises.⁴ We investigate the changes in the behavior of the indexes, if any, before and after launch across different regions. We conclude the paper by answering a selection of the most common questions our clients have asked about the indexes and low volatility investing, in the form of a brief Q&A.

¹ Alighanbari, M., S. Doole and D. Shankar. (2016). "[Designing Low-Volatility Strategies.](#)" *The Journal of Index Investing*, Vol. 7, No. 3, pp. 21-33.

² Alighanbari, M., S. Doole and D. Melas. (2017). "[Managing Risk beyond Volatility.](#)" *The Journal of Index Investing*, Vol. 8, No. 2, pp. 68-76.

³ Alighanbari, M. and S. Doole. (2018). "[The Capacity of Factor Index Strategies: Assessment and Control.](#)" *The Journal of Index Investing*, Vol. 9, No. 2, pp. 34-52.

⁴ This report may contain analysis of historical data, which may include hypothetical, backtested or simulated performance results. There are frequently material differences between backtested or simulated performance results and actual results subsequently achieved by any investment strategy. Please see the disclaimers at the end of this paper for more information.

A TEN-YEAR JOURNEY

BEHAVIOR OF THE INDEX: LIVE VERSUS BACKTESTING

No matter the strategy, backtested performance should always be assessed with a critical eye. For example, historical returns are often halved to be used as a more robust estimate of future returns (Ratcliffe et al., 2017 and Suhonen et al., 2017). Out-of-sample data can shed additional light on the strategy and reveal potential shortcomings. The launch of the MSCI Minimum Volatility Indexes in 2008 was accompanied by more than 10 years of backtested history. While minimum variance is a well-known concept that has been in use for many years, the choice of specific constraints in the construction of such an index may have risked over-fitting to history. Moreover, while backtesting was undertaken with best efforts to reflect realistic and achievable performance, the fact that the index did not yet exist or form the basis of any strategy distinguished it from a live index.

In this paper, we look at live data on the MSCI Minimum Volatility Indexes over the past 10 years to see if their characteristics were in line with their objectives and whether there were obvious differences in behavior when compared to the simulated backtests.

Exhibit 1 shows the performance of the MSCI World Minimum Volatility Index over the past 20 years, the first 10 years being backtested and the second 10 using live data. Over the whole period, the index demonstrated lower volatility than the market-cap weighted index (9.5 vs. 13.7 in-sample and 11.5 vs. 16.0 out-of-sample). The 3-year rolling volatility of the MSCI World Minimum Volatility Index is compared to the parent index⁵ in Exhibit 2. The MSCI World Minimum Volatility Index persistently showed lower volatility than the parent over this period. Any improvement in volatility is, of course, more significant when market volatility is high. During calmer markets, such as in 2006-2007 and more recently in 2015, when the volatility of the market dropped to single digits, there was little room for improvement. As we can see in the exhibit on the following page, the volatility of the index was very close to the parent index.

⁵ Parent index is the market-cap index from which this index is created. Here, it's the MSCI World Index.

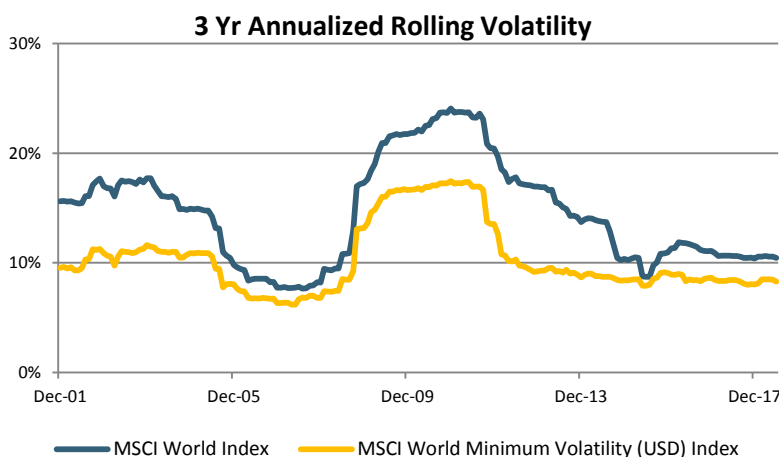
Exhibit 1: Key Metrics of MSCI World Minimum Volatility Index before and after Launch

| Key Metrics | Before Launch | | After Launch | |
|-----------------------------------|---------------|--------------------------|--------------|--------------------------|
| | MSCI World | World Minimum Volatility | MSCI World | World Minimum Volatility |
| Total Return (%) | 4.2 | 5.9 | 6.9 | 8.2 |
| Total Risk (%) | 13.7 | 9.5 | 16.0 | 11.5 |
| Return/Risk | 0.31 | 0.62 | 0.43 | 0.71 |
| Active Return (%) | | 1.70 | | 1.30 |
| Tracking Error (%) | | 7.10 | | 7.80 |
| Information Ratio | | 0.24 | | 0.17 |
| Historical Beta | 1.00 | 0.61 | 1.00 | 0.64 |
| Performance (%) | | | | |
| 1 Yr | -10.1 | -8.0 | 11.5 | 7.8 |
| 3 Yr | 9.4 | 7.4 | 9.1 | 9.7 |
| 5 Yr | 12.5 | 12.1 | 10.5 | 10.4 |
| Key Risk Metrics | | | | |
| Annualized Downside Deviation (%) | 9.5 | 6.4 | 11.2 | 8.0 |
| Sortino Ratio | 0.44 | 0.93 | 0.61 | 1.01 |
| VaR @ 95% | -7.4 | -4.9 | -8.6 | -4.6 |
| VaR @ 99% | -9.6 | -7.4 | -14.0 | -11.6 |
| Max Drawdown (%) | 49.4 | 25.8 | 49.6 | 40.9 |

Period: 31-Dec-1998 to 30-Jun-2008

Period: 30-Jun-2008 to 29-Jun-2018

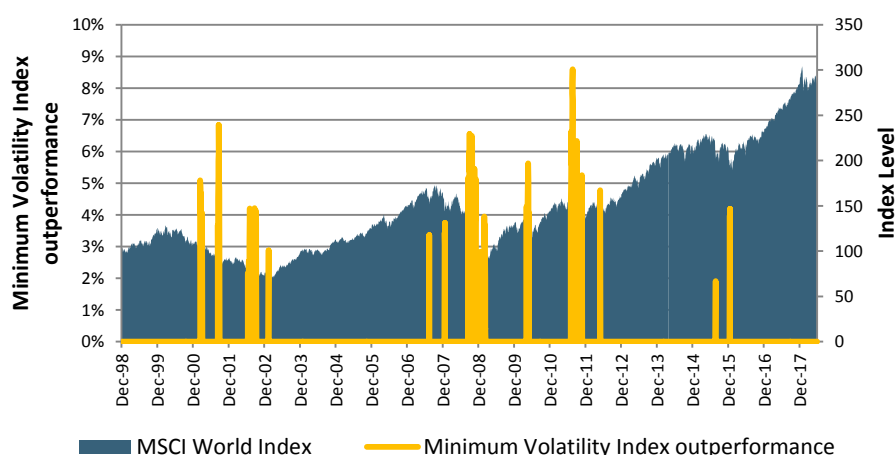
Exhibit 2: Realized Volatility of the MSCI World and World Minimum Volatility Indexes



Another objective of a minimum volatility index is “defensiveness,” which means seeking a more benign drawdown in turbulent markets than a market cap-weighted index. The maximum drawdown of the MSCI World Index during the last 20 years occurred in 2008 (-57.5%); the maximum drawdown for the MSCI World Minimum Volatility Index for the same period was -47.7%, about 10 percentage points less than the parent index. This was in the post-launch period. While the maximum drawdown gives us a good sense of the risk of the indexes, it does not capture the whole picture. There have been other large drawdowns that

were not as extreme as in 2008. Exhibit 3 shows the 1-month performance of the MSCI World Minimum Volatility Index relative to the MSCI World Index, for the occasions when the benchmark lost more than 10% within a 1-month period (rolling 1-month maximum drawdown > 10%). For all those times when the parent index fell by 10% or more, the MSCI World Minimum Volatility Index showed smaller drawdowns, outperforming the parent index by between 2% and 9%.

Exhibit 3: Outperformance of MSCI World Minimum Volatility Index during Market Downturns



Finally, in terms of the low-volatility premium, the MSCI World Minimum Volatility Index outperformed the parent index by an annual average of 1.7% over the 10-year backtesting period before launch. For the last 10 years of live data, the annual performance was 1.3% (Exhibit 1). Most of the outperformance was attributed to the more turbulent market of the first five years (2008-2013). For the most recent five years, the return of the MSCI World Minimum Volatility Index has been in line with the parent index; unsurprisingly given this has been a low-volatility up-trending market. However, over this period, the MSCI World Minimum Volatility Index has had lower volatility and superior risk-adjusted performance. The return/risk ratio improvement relative to the parent index for the out-of-sample period (0.71 vs. 0.43) was in line with the in-sample period (0.62 vs. 0.31).

Exhibit 4 demonstrates a summary of key metrics for MSCI Minimum Volatility Indexes versus their parent indexes for other selected regions. The results tell a similar story to the one above. The indexes' behavior for the live period was in line with expectations and the backtested data. Over the past 10 years, different indexes have shown different levels of premiums, sometimes higher and sometimes lower than for the longer term period. But they all showed lower risk, as measured by total risk, downside risk, drawdown and value at risk (VaR).

Exhibit 4: Behavior of MSCI Minimum Volatility Indexes across Regions

| | ACWI | | Emerging Markets | | USA | | Japan | |
|-----------------------------------|------------|--------------------|------------------|--------------------|------------|--------------------|------------|--------------------|
| | Market Cap | Minimum Volatility | Market Cap | Minimum Volatility | Market Cap | Minimum Volatility | Market Cap | Minimum Volatility |
| Total Return (%) | 5.7 | 8.2 | 9.6 | 11.3 | 6.0 | 7.4 | 3.7 | 5.0 |
| Total Risk (%) | 15.2 | 10.2 | 21.9 | 17.0 | 14.5 | 11.2 | 16.6 | 13.5 |
| Return/Risk | 0.37 | 0.81 | 0.44 | 0.66 | 0.42 | 0.66 | 0.23 | 0.37 |
| Active Return (%) | | 2.50 | | 1.70 | | 1.30 | | 1.20 |
| Tracking Error (%) | | 7.80 | | 6.80 | | 6.30 | | 7.10 |
| Information Ratio | | 0.32 | | 0.25 | | 0.21 | | 0.17 |
| Historical Beta | 1.00 | 0.59 | 1.00 | 0.75 | 1.00 | 0.70 | 1.00 | 0.74 |
| Performance (%) | | | | | | | | |
| 1 Yr | 11.1 | 7.9 | 8.3 | 8.2 | 14.7 | 11.1 | 10.3 | 10.0 |
| 3 Yr | 8.8 | 9.0 | 6.5 | 3.7 | 11.8 | 12.1 | 6.8 | 9.4 |
| 5 Yr | 10.0 | 9.7 | 5.4 | 3.4 | 13.4 | 12.8 | 7.7 | 9.2 |
| 10 Yr | 6.4 | 8.5 | 2.6 | 5.7 | 10.1 | 11.2 | 3.8 | 6.0 |
| Key Risk Metrics | | | | | | | | |
| Annualized Downside Deviation (%) | 10.6 | 6.8 | 14.4 | 11.0 | 9.9 | 7.4 | 11.0 | 8.7 |
| Sortino Ratio | 0.53 | 1.21 | 0.67 | 1.03 | 0.61 | 0.99 | 0.34 | 0.57 |
| VaR @ 95% | -8.2 | -4.8 | -9.0 | -7.1 | -7.3 | -4.6 | -7.5 | -5.5 |
| VaR @ 99% | -11.2 | -7.1 | -15.8 | -12.2 | -10.4 | -9.6 | -11.7 | -10.0 |
| Max Drawdown (%) | 58.1 | 42.9 | 65.1 | 53.7 | 54.9 | 46.6 | 60.4 | 46.6 |

Period of analysis: Dec. 31, 1998 to June 29, 2018. The analyses are based on gross total return in USD.

MINIMUM VOLATILITY INDEXES: FREQUENTLY ASKED QUESTIONS

In this section we have brought together and answered select questions investors have had around low-volatility investing in the form of a Q&A. When appropriate, we have referenced – and provided links to – previously published papers and blogs for those looking for more in-depth discussion and analysis.

Q1: WHY DID YOU CHOOSE AN OPTIMIZATION APPROACH TO CONSTRUCT THE LOW-VOLATILITY INDEXES?

A1: There are two main approaches to constructing low volatility indexes – a heuristic approach and optimization – with pros and cons for each. The heuristic approach, where stocks are ranked based on a measure of volatility (often historical volatility) and then the lowest volatility stocks are selected to create the index, is simple in construction. The optimization approach is more complex, but provides flexibility to control other important objectives such as investability, avoiding large overweights on specific stocks, sectors or countries, manageable turnover, etc. (more on this in Q4). Optimization is the only construction method where the effect of correlation on index volatility reduction is taken into account. The level of correlation between stocks within a portfolio has a large impact on the volatility of the portfolio. Optimization is also the only approach where the selection of lower volatility stocks can be traded off against the selection of lowly correlated stocks when aiming for an index with the lowest level of volatility (more on this in Q3).⁶

Q2: WHAT ARE THE POTENTIAL BENEFITS OF USING MULTI-FACTOR MODELS FOR INDEX CONSTRUCTION?

A2: To construct a low-volatility index we need to estimate the volatility of each stock (and the correlations between stocks). The simple approach is to use volatility and correlations from historical returns. There are two issues with this approach. First, the number of parameters to estimate grows as the number of stocks increases (e.g., for 1,600 stocks,⁷ we would need to estimate more than 1.28 million parameters). Second, and more importantly, estimates rely solely on historical returns of individual stocks, which may have been affected by special events and do not take into account changes in a company's characteristics over time. A multi-factor model is designed to address both these issues. The parameters to be estimated are the volatility of factors and the correlation between them, and as the number of stocks grows the number of parameters to be estimated remains constant. Furthermore,

⁶ For more detailed discussion please see Alighanbari, M., S. Doole, L. Mrig and D. Shankar. (2016). "[Constructing Low Volatility Strategies](#)." MSCI Research Insight.

⁷ The MSCI World Index had around 1,600 constituents as of November 2018.

multi-factor models have historically provided better estimates of volatility (compared to historical volatility), as they can reflect changes in the characteristics of a company and have withstood outliers in asset data. In addition, using a fundamental factor model, such as the Barra Global Total Market Equity Model for Long-Term Investors (GEM LT), has not only provided more accurate estimates of risk (Conner, 1995) but also has offered a more thorough and meaningful risk breakdown.⁸

Q3: WHY IS CORRELATION CONSIDERED WHEN CREATING THE LOW-VOLATILITY INDEX?

A3: As discussed in Q1, using optimization is the only way to capture correlation in addition to volatility. In the appendix of [“Constructing Low Volatility Strategies”](#) we provided a framework and some analysis to show that the contribution of correlation to index volatility reduction has been significant.⁹ Using this framework, we showed that about half of the volatility reduction came from selecting low-volatility stocks and the other half from selecting lowly correlated stocks.

Q4: HOW DO CONSTRAINTS HELP CONSTRUCT A REPLICABLE MINIMUM VOLATILITY INDEX?

A4: If the only objective was to have an index with the lowest expected volatility, an unconstrained optimization would be the ideal solution. However, for an index to be replicable there are broader considerations and constraints can help ensure the resulting index satisfies these. An unconstrained minimum volatility index can be concentrated, have large weightings on less-liquid names, have large active exposure to certain countries or sectors or require large turnover on each rebalance. Within an optimization framework, simple and explicit constraints can be incorporated into the methodology to control all these important dimensions. Our analyses show that incorporating constraints had minimal impact on the volatility reduction characteristics of the index while still achieving important investability objectives.¹⁰

Q5: WHY IS TURNOVER CONSTRAINED?

A5: Higher turnover means higher transaction costs for a portfolio or product replicating / tracking the index, and can be justified only if it results in sufficiently better performance (higher return or lower volatility). In [“Constructing Low Volatility Strategies”](#) we

⁸ [Barra Risk Model Handbook](#).

⁹ Please see Alighanbari, M., S. Doole, L. Mrig and D. Shankar. (2016). [“Constructing Low Volatility Strategies.”](#) MSCI Research Insight.

¹⁰ For more detailed discussion please see Alighanbari, M., S. Doole, L. Mrig and D. Shankar. (2016). [“Constructing Low Volatility Strategies.”](#) MSCI Research Insight.

demonstrated the effect of turnover on the volatility of the MSCI Minimum Volatility Indexes.¹⁰ The results showed that for about the first 10% of turnover there was a considerable reduction in volatility, but for turnover beyond that volatility reduction was insignificant. A turnover constraint aims to limit the optimization to necessary turnover only. In the MSCI Minimum Volatility Indexes, the one-way turnover is constrained to 10% at each semi-annual rebalance (20% annually).¹¹

Q6: HAS THE TURNOVER CONSTRAINT CREATED PATH DEPENDENCY? WHAT IS THE IMPACT?

A6: Turnover constraint can indeed create path dependency. It means that indexes with the same methodology but different starting points can have different constituents over time. However, this path dependency has not affected the behavior of the indexes or their risk/return characteristics. In [“Constructing Low Volatility Strategies”](#) we showed that MSCI Minimum Volatility Indexes that differ only in their inception dates had similar risks and returns over time.¹⁰

Q7: WITH MORE AUM TRACKING THE MINIMUM VOLATILITY INDEXES, COULD VALUATION BECOME AN ISSUE?

A7: In Q3 we discussed incorporating constraints into the design of minimum volatility indexes. In the MSCI Minimum Volatility Indexes, there are constraints on active exposure to different style factors. Constraint on the value factor works to keep the valuation of a minimum volatility index within a narrow band of its broad market-cap weighted benchmark in order to keep the index from becoming materially overvalued. In [“Managing Risks beyond Volatility”](#) we also showed that while the valuations of the MSCI Minimum Volatility Indexes have changed over time, at no point did they become significantly “rich,”¹² though this is not indicative of how the indexes may perform in the future.

Q8: ARE THE MINIMUM VOLATILITY INDEXES RUNNING OUT OF CAPACITY?

A8: There actually are two questions here; the one above and: How do we measure capacity? Measuring capacity is an important topic that has been researched extensively. In [“The Capacity of Factor Index Strategies: Assessment and Control”](#) we use specific characteristics of factor investing to devise an approach to measure and account for capacity

¹¹ For details of constraints, please see the [MSCI Minimum Volatility Index Methodology Book](#).

¹² For more detailed discussion please see Alighanbari, M., S. Doole and D. Melas. (2017). [“Managing Risks beyond Volatility.”](#) *The Journal of Index Investing*, Vol. 8, No. 2, pp. 68-76.

for factor indexes.¹³ In the report we discussed how the MSCI Minimum Volatility Indexes' methodology incorporates constraints designed to help improve their capacity. We also present some empirical analyses suggesting these indexes have not shown signs of reaching their capacity. Ang et al. (2017) and Ratcliffe et al. (2017) use empirical data to explore the capacity of various factor indexes including the MSCI Minimum Volatility Indexes, the levels of which were orders of magnitude higher than the AUM currently tracking the MSCI Minimum Volatility Indexes.

Q9: CAN ESG BE INCORPORATED INTO A MINIMUM VOLATILITY INDEX? HOW?

A9: We have previously shown ESG to be a dimension of risk ([Giese et al., 2017](#)). As such, it is natural to incorporate it into indexes that are designed to show low risk, such as minimum volatility indexes. In [Alighanbari et al. \(2017\)](#) we showed that the optimization framework allows ESG metrics to be incorporated into the MSCI Minimum Volatility Indexes.

Q10: WHAT IS THE LOW-VOLATILITY FACTOR PREMIUM?

A10: The low-volatility factor seeks to capture excess returns to stocks with lower than average volatility, beta and/or idiosyncratic risk. Although the capital asset pricing model (CAPM) suggests that riskier assets should earn higher returns, empirical research shows that less risky stocks have historically outperformed the market. The low-volatility premium has mostly been explained by behavioral arguments, though the investment constraints that some investors face have also been proposed by researchers to explain this anomaly (Bender et al., 2013). The MSCI Minimum Volatility Indexes seek to capture this premium by selecting lower volatility stocks.

Q11: WHAT DOES BASE CURRENCY IN OPTIMIZATION MEAN?

A11: When investing in international equities, investors' returns depend on the return of a stock in its local currency, as well as changes in the exchange rate with their home currency. For instance, a U.S. investor investing in USD may see a different return for a Japanese investment compared to a GBP-based investor investing in the same asset. Therefore when assessing volatility, one should be mindful of these actual returns observed by the investor. The base currency in the optimization indicates the investor's currency. Optimizing in different currencies can result in different portfolios, although the differences have often been small. The optimization can also be done in local currency which means removing the

¹³ For more detailed discussion please see Alighanbari, M. and S. Doole. (2018). "[The Capacity of Factor Index Strategies: Assessment and Control](#)." *The Journal of Index Investing*, Vol. 9, No. 2, pp. 34-52.

currency effect altogether. The local-currency-optimized index is the optimal solution when the investor intends to fully hedge currency exposures.¹⁴

Q12: HAVE THE CHARACTERISTICS OF THE MSCI MINIMUM VOLATILITY INDEXES CHANGED SINCE THEIR LAUNCH IN 2008?

A12: The MSCI Minimum Volatility Indexes were launched with over 10 years of simulated history. While we simulate history for our indexes by applying the methodology to point-in-time data to achieve a meaningful representation of how the index would have performed, in the end these are still simulations. This means, among other things, that there was no AUM tracking an index during the simulation period, and therefore no market impact or any of the capacity, liquidity and valuation effects we discussed in previous questions. In this report we contrasted the 10-year live performance of the indexes with the preceding 10 years of backtesting and showed that the index characteristics have not changed materially since launch. It should also be noted that the methodology of the MSCI Minimum Volatility Indexes has been essentially unchanged since launch. In this methodology, the index construction aims to use the latest Barra factor model. As a result, the Barra factor models GEM2 and GEM LT were used for index construction once introduced.

Q13: WHAT HAVE RISING INTEREST RATES MEANT FOR MINIMUM VOLATILITY STRATEGIES?

A13: In a [blog that addresses this question](#),¹⁵ the authors dissected the return of minimum volatility strategies that replicate the indexes into equity and bond premiums and other return components, using data from 1963 to 2017. The analysis showed minimum volatility had rather stable exposure to the equity factor. Meanwhile, its exposure to the bond factor in rising rate environments was half that in declining rate environments. This meant that while the bond factor contributed positively (1.1% annually) to performance in declining rate periods, it caused a mere 16 basis points drag on performance in the rising rate period. Further analysis showed that when interest rates were rising, there were periods of under and outperformance linked to market volatility. Risk reduction, which is one of the main objectives of minimum volatility, was persistent and comparable for both rising and declining rate periods.

¹⁴ For more detailed discussion please see the appendix of "Alighanbari, M., S. Doole, L. Mrig and D. Shankar. (2016). "Constructing Low Volatility Strategies." MSCI Research Insight.

¹⁵ Zhen, W. (2017). "[What do rising interest rates mean for minimum volatility strategies?](#)" MSCI Research Insight.

Q14: WHAT ABOUT APPROACHES TO MITIGATE OTHER DIMENSIONS OF RISK?

A14: There are various other approaches to seek reduced risk. For example, rather than focusing on volatility, a minimum conditional value at risk (CVaR) approach focuses on minimizing tail risk. In Downing et al. (2015) the authors show that a minimum volatility strategy was competitive with minimum-CVaR in mitigating tail risk exposure. In [Alighanbari et al. \(2017\)](#) we compared a minimum volatility strategy with a maximum diversification approach and showed that, while achieving a similar level of diversification, a minimum volatility strategy targeted and benefited from the low-volatility premium. Overall, a well-designed minimum volatility strategy has not only improved risk in terms of ex-ante and ex-post volatility, but also other dimensions of risk, such as drawdowns and CVaR.

Q15: HAS MINIMUM VOLATILITY MAINTAINED ITS CHARACTERISTICS IN NARROWER MARKETS?

A15: In principle, yes. Of course, the larger and more diverse the universe, the more flexibility is given to the optimization to find the lowest possible volatility portfolio while satisfying all the constraints. But as long as there were enough stocks in the universe to make the methodology meaningful, then minimum volatility has demonstrated its expected behaviors, such as lower risk (lower volatility, drawdown, tail risk, etc.) and long-term historical premium. For instance, the MSCI Minimum Volatility Indexes exist not only for global and regional universes but also on a narrower basis in countries, such as Brazil, Switzerland, Canada and, more recently, in China A. In [a recent blog](#)¹⁶ our colleagues showed that in the China A market, a minimum volatility portfolio historically displayed lower risk and higher return compared to the market-cap weighted index.

¹⁶ Zhen, W. (2018). "[How the low volatility factor has performed in China A shares.](#)" MSCI Research Insight.

CONCLUSIONS

2018 marked the 10-year anniversary of the launch of the MSCI Minimum Volatility Indexes. We analyzed the 10-year live data and contrasted it with historical backtests. Results for the MSCI World Minimum Volatility Index, as well as for various other regions, showed that out of sample, the indexes behaved as expected and in line with in-sample observations. Over the past 10 years, the indexes have shown lower volatility, defensiveness and higher long-term returns compared to their market-cap parent indexes. These characteristics of the MSCI Minimum Volatility Indexes have not shown any apparent signs of diminishing since their launch and as more AUM have tracked them.

Over the last 10 years, we have received many questions from investors about the indexes' construction, behavior and potential benefits. We have written various papers to cover these topics in detail and discussed them with our clients. In this paper we summarized some of these findings in the form of a brief Q&A, with references and links to the appropriate papers and blogs for more details and in-depth analysis.

REFERENCES

- Alighanbari, M., S. Doole and D. Shankar. (2016). "Designing Low-Volatility Strategies." *The Journal of Index Investing*, Vol. 7, No. 3, pp. 21-33.
- Alighanbari, M., S. Doole and D. Melas. (2017). "Managing Risks Beyond Volatility." *The Journal of Index Investing*, Vol. 8, No. 2, pp. 68-76.
- Alighanbari, M. and S. Doole. (2018). "The Capacity of Factor Index Strategies: Assessment and Control." *The Journal of Index Investing*, Vol. 9, No. 2, pp. 34-52.
- Ang, A., A. Madhavan and A. Sobczyk. (2017). "Crowding, Capacity, and Valuation of Minimum Volatility Strategies." *The Journal of Index Investing*, Vol. 8, No. 2, pp. 39-50.
- Bender, J., R. Briand, D. Melas and R. Aylur Subramanian. (2013). "Foundations of Factor Investing." MSCI Research Insight.
- Conner, G., L. Goldberg and R. Korajczyk. (2010). "Portfolio Risk Analysis." Princeton University Press.
- Downing, C., A. Madhavan, A. Ulitsky and A. Singh (2015). "Portfolio Construction and Tail Risk." *The Journal of Portfolio Management*, Vol. 42, No. 1, pp. 85-102.
- Giese, G., L. Lee, D. Melas, Z. Nagy and L. Nishikawa. (2017). "Foundations of ESG Investing – Part 1: How ESG Affects Equity Valuation, Risk and Performance." MSCI Research Insight.
- Ratcliffe, R., P. Miranda and A. Ang. (2017). "Capacity of Smart Beta Strategies from a Transaction Cost Perspective." *The Journal of Index Investing*, Vol. 7, No. 4, pp. 41-50.
- Suhonen, A., M. Lennkh and F. Perez. (2017). "Quantifying Backtest Overfitting in Alternative Beta Strategies." *The Journal of Portfolio Management*, Vol. 43, No. 2, pp. 90-104.

CONTACT US

clientservice@msci.com

AMERICAS

| | |
|---------------|-------------------|
| Americas | 1 888 588 4567 * |
| Atlanta | + 1 404 551 3212 |
| Boston | + 1 617 532 0920 |
| Chicago | + 1 312 675 0545 |
| Monterrey | + 52 81 1253 4020 |
| New York | + 1 212 804 3901 |
| San Francisco | + 1 415 836 8800 |
| Sao Paulo | + 55 11 3706 1360 |
| Toronto | + 1 416 628 1007 |

EUROPE, MIDDLE EAST & AFRICA

| | |
|-----------|--------------------|
| Cape Town | + 27 21 673 0100 |
| Frankfurt | + 49 69 133 859 00 |
| Geneva | + 41 22 817 9777 |
| London | + 44 20 7618 2222 |
| Milan | + 39 02 5849 0415 |
| Paris | 0800 91 59 17 * |

ASIA PACIFIC

| | |
|-------------|-----------------------|
| China North | 10800 852 1032 * |
| China South | 10800 152 1032 * |
| Hong Kong | + 852 2844 9333 |
| Mumbai | + 91 22 6784 9160 |
| Seoul | 00798 8521 3392 * |
| Singapore | 800 852 3749 * |
| Sydney | + 61 2 9033 9333 |
| Taipei | 008 0112 7513 * |
| Thailand | 0018 0015 6207 7181 * |
| Tokyo | + 81 3 5290 1555 |

*toll free

ABOUT MSCI

For more than 40 years, MSCI's research-based indexes and analytics have helped the world's leading investors build and manage better portfolios. Clients rely on our offerings for deeper insights into the drivers of performance and risk in their portfolios, broad asset class coverage and innovative research.

Our line of products and services includes indexes, analytical models, data, real estate benchmarks and ESG research.

MSCI serves 99 of the top 100 largest money managers, according to the most recent P&I ranking.

For more information, visit us at www.msci.com.

NOTICE AND DISCLAIMER

This document and all of the information contained in it, including without limitation all text, data, graphs, charts (collectively, the “Information”) is the property of MSCI Inc. or its subsidiaries (collectively, “MSCI”), or MSCI’s licensors, direct or indirect suppliers or any third party involved in making or compiling any Information (collectively, with MSCI, the “Information Providers”) and is provided for informational purposes only. The Information may not be modified, reverse-engineered, reproduced or disseminated in whole or in part without prior written permission from MSCI.

The Information may not be used to create derivative works or to verify or correct other data or information. For example (but without limitation), the Information may not be used to create indexes, databases, risk models, analytics, software, or in connection with the issuing, offering, sponsoring, managing or marketing of any securities, portfolios, financial products or other investment vehicles utilizing or based on, linked to, tracking or otherwise derived from the Information or any other MSCI data, information, products or services.

The user of the Information assumes the entire risk of any use it may make or permit to be made of the Information. NONE OF THE INFORMATION PROVIDERS MAKES ANY EXPRESS OR IMPLIED WARRANTIES OR REPRESENTATIONS WITH RESPECT TO THE INFORMATION (OR THE RESULTS TO BE OBTAINED BY THE USE THEREOF), AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, EACH INFORMATION PROVIDER EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES (INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF ORIGINALITY, ACCURACY, TIMELINESS, NON-INFRINGEMENT, COMPLETENESS, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) WITH RESPECT TO ANY OF THE INFORMATION.

Without limiting any of the foregoing and to the maximum extent permitted by applicable law, in no event shall any Information Provider have any liability regarding any of the Information for any direct, indirect, special, punitive, consequential (including lost profits) or any other damages even if notified of the possibility of such damages. The foregoing shall not exclude or limit any liability that may not by applicable law be excluded or limited, including without limitation (as applicable), any liability for death or personal injury to the extent that such injury results from the negligence or willful default of itself, its servants, agents or sub-contractors.

Information containing any historical information, data or analysis should not be taken as an indication or guarantee of any future performance, analysis, forecast or prediction. Past performance does not guarantee future results.

The Information should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions. All Information is impersonal and not tailored to the needs of any person, entity or group of persons.

None of the Information constitutes an offer to sell (or a solicitation of an offer to buy), any security, financial product or other investment vehicle or any trading strategy.

It is not possible to invest directly in an index. Exposure to an asset class or trading strategy or other category represented by an index is only available through third party investable instruments (if any) based on that index. MSCI does not issue, sponsor, endorse, market, offer, review or otherwise express any opinion regarding any fund, ETF, derivative or other security, investment, financial product or trading strategy that is based on, linked to or seeks to provide an investment return related to the performance of any MSCI index (collectively, “Index Linked Investments”). MSCI makes no assurance that any Index Linked Investments will accurately track index performance or provide positive investment returns. MSCI Inc. is not an investment adviser or fiduciary and MSCI makes no representation regarding the advisability of investing in any Index Linked Investments.

Index returns do not represent the results of actual trading of investable assets/securities. MSCI maintains and calculates indexes, but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the index or Index Linked Investments. The imposition of these fees and charges would cause the performance of an Index Linked Investment to be different than the MSCI index performance.

The Information may contain back tested data. Back-tested performance is not actual performance, but is hypothetical. There are frequently material differences between back tested performance results and actual results subsequently achieved by any investment strategy.

Constituents of MSCI equity indexes are listed companies, which are included in or excluded from the indexes according to the application of the relevant index methodologies. Accordingly, constituents in MSCI equity indexes may include MSCI Inc., clients of MSCI or suppliers to MSCI. Inclusion of a security within an MSCI index is not a recommendation by MSCI to buy, sell, or hold such security, nor is it considered to be investment advice.

Data and information produced by various affiliates of MSCI Inc., including MSCI ESG Research LLC and Barra LLC, may be used in calculating certain MSCI indexes. More information can be found in the relevant index methodologies on www.msci.com.

MSCI receives compensation in connection with licensing its indexes to third parties. MSCI Inc.’s revenue includes fees based on assets in Index Linked Investments. Information can be found in MSCI Inc.’s company filings on the Investor Relations section of www.msci.com.

MSCI ESG Research LLC is a Registered Investment Adviser under the Investment Advisers Act of 1940 and a subsidiary of MSCI Inc. Except with respect to any applicable products or services from MSCI ESG Research, neither MSCI nor any of its products or services recommends, endorses, approves or otherwise expresses any opinion regarding any issuer, securities, financial products or instruments or trading strategies and MSCI’s products or services are not intended to constitute investment advice or a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such. Issuers mentioned or included in any MSCI ESG Research materials may include MSCI Inc., clients of MSCI or suppliers to MSCI, and may also purchase research or other products or services from MSCI ESG Research. MSCI ESG Research materials, including materials utilized in any MSCI ESG Indexes or other products, have not been submitted to, nor received approval from, the United States Securities and Exchange Commission or any other regulatory body.

Any use of or access to products, services or information of MSCI requires a license from MSCI. MSCI, Barra, RiskMetrics, IPD, InvestorForce, and other MSCI brands and product names are the trademarks, service marks, or registered trademarks of MSCI or its subsidiaries in the United States and other jurisdictions. The Global Industry Classification Standard (GICS) was developed by and is the exclusive property of MSCI and Standard & Poor’s. “Global Industry Classification Standard (GICS)” is a service mark of MSCI and Standard & Poor’s.