

Profiling Minimum Volatility

CAPM is a “theoretical tour de force” but “empirically elusive.”

- *The Capital Asset Pricing Model: Theory and Evidence*,
Fama and French¹

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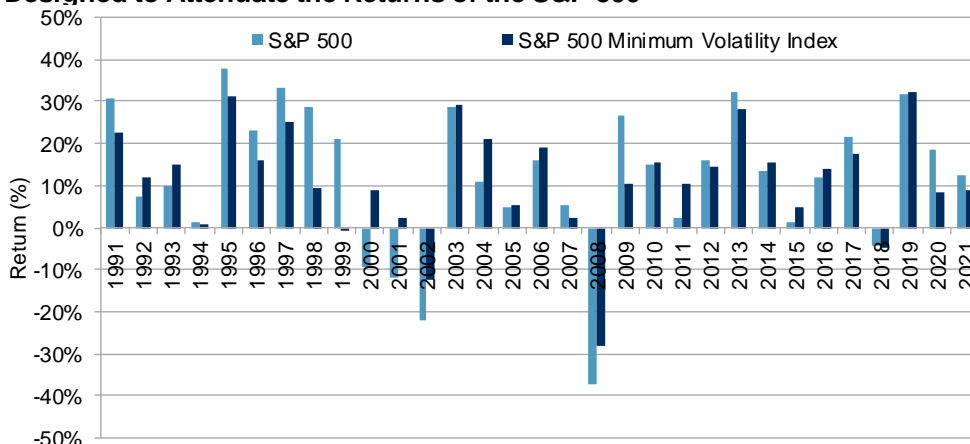
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EXECUTIVE SUMMARY

- Minimum volatility is part of a broader group of defensive strategies that have been in existence for decades. They are based on the low volatility anomaly, the phenomenon that lower-risk stocks outperform over time, contradicting the conventional wisdom that risk and reward go hand in hand.
- Low volatility strategy indices attempt to exploit this anomaly systematically. The typical behavior patterns of low volatility strategies are that they go up less when the market is up and go down less when the market is down. They offer *protection* in down markets and *participation* in up markets.
- More than with most factor strategies, the potential value added of low volatility strategies is largely dependent on market dynamics. Dispersion of returns tends to be higher in times of crisis; this disparity gives defensive strategies such as low volatility a leg up.

Exhibit 1: As a Defensive Strategy, the S&P 500[®] Minimum Volatility Index Is Designed to Attenuate the Returns of the S&P 500



Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1990, to May 31, 2021. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

¹ Fama, Eugene F. and Kenneth R. French, “[The Capital Asset Pricing Model: Theory and Evidence](#),” *Journal of Economic Perspectives*, Vol. 18, No. 3. (Summer 2004), pp. 25-46.

INTRODUCTION

Following a few years of significant market gains, enthusiasm for low volatility strategies has waned, particularly compared with the period after the 2008 Global Financial Crisis.² This is understandable since protection is probably not top of mind when things are going well and are seemingly on an upward trajectory.

The low volatility anomaly is the phenomenon of lower-risk assets outperforming higher-risk assets over time.

THE LOW VOLATILITY ANOMALY

Low volatility strategies explicitly aim to deliver a pattern of returns relative to the market. Their goal is to reduce risk (volatility), and that goal is constant in both good times and bad.

Low volatility is a *characteristic*. Low volatility *accompanied by outperformance* is an anomaly. The phenomenon of lower-risk assets also *outperforming* higher-risk assets over time was noted by academics almost half a century ago.³ Flouting the conventional wisdom that risk and return go hand in hand, this phenomenon was dubbed the low volatility *anomaly*. Outperformance does not occur at *all* times (particularly in strong market performance cycles), but the anomaly has been observed universally across different markets and asset classes.⁴

When it comes to low volatility portfolios, there are different approaches to index construction that yield different characteristics and results.⁵ In the U.S., the [S&P 500 Minimum Volatility Index](#) is one way to pursue lower risk in a systematic way.⁶

The S&P 500 Minimum Volatility Index provides a systematic way to pursue lower risk by minimizing volatility.

The methodology underlying the S&P 500 Minimum Volatility Index relies on optimization, minimizing volatility subject to stock- and sector-level exposure constraints. Compared with a rankings-based methodology such as the one used for the [S&P 500 Low Volatility Index](#), the optimized approach has typically resulted in less performance divergence from the benchmark.

² Ballentine, Claire, "[Traders Ditch Defensive Quant ETFs as 2020 Turmoil Drags On](#)," Bloomberg, Oct. 28, 2020.

³ Jensen, Michael C., Fischer Black, and Myron S. Scholes, "[The Capital Asset Pricing Model: Some Empirical Tests](#)," *Studies in the Theory of Capital Markets*, Praeger Publishers Inc., 1972; see also: Fama, Eugene F. and James D. MacBeth, "[Risk, Return, and Equilibrium: Empirical Tests](#)," *The Journal of Political Economy*, Vol. 81, No. 3. (May-June 1973), pp. 607-636.

⁴ Chan, Fei Mei and Craig J. Lazzara, "[Is the Low Volatility Anomaly Universal?](#)" S&P Dow Jones Indices, April 2019.

⁵ Soe, Aye M., "[Inside Low Volatility Indices](#)," S&P Dow Jones Indices, January 2017.

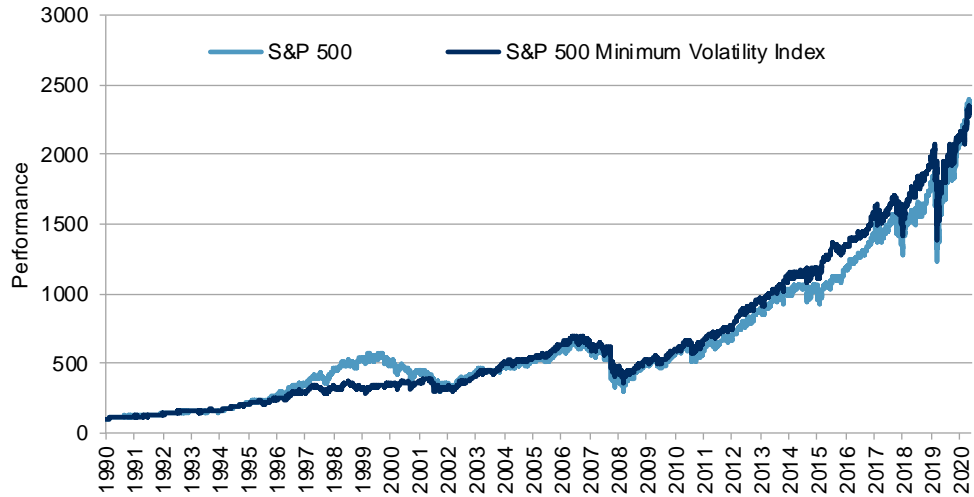
⁶ The index is designed to seek lower total risk, measured by standard deviation, than the S&P500 while maintaining similar characteristics. For the complete methodology, see [S&P Minimum Volatility Index Methodology](#).

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Exhibit 2: The S&P 500 Minimum Volatility Index Has at Times Outperformed the S&P 500 but with Lower Risk

The optimized approach of the minimum volatility strategy typically resulted in less performance divergence from the benchmark.

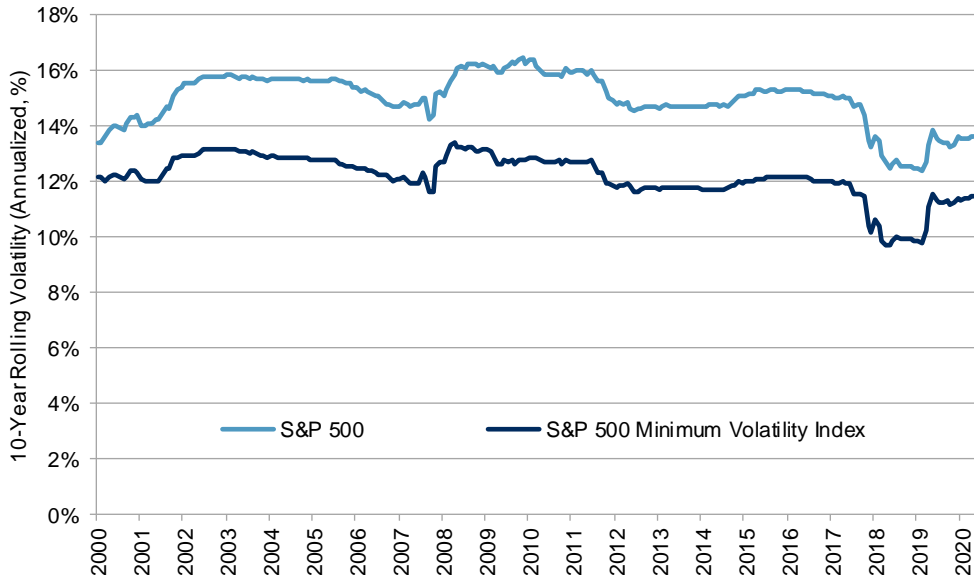


Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1990, to May 31, 2021. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

In the period from January 1991 through May 2021, the minimum volatility index delivered nearly the same return as the benchmark [S&P 500](#), but at substantially lower risk—a 16% reduction. On a 10-year rolling basis, the S&P 500 Minimum Volatility Index’s volatility was consistently lower than the S&P 500 throughout the entire period (see Exhibit 3).

Exhibit 3: The S&P 500 Minimum Volatility Index Has Been Consistently Less Volatile than the S&P 500

Historically, the minimum volatility index delivered nearly the same return as the S&P 500, but at a substantially lower risk.



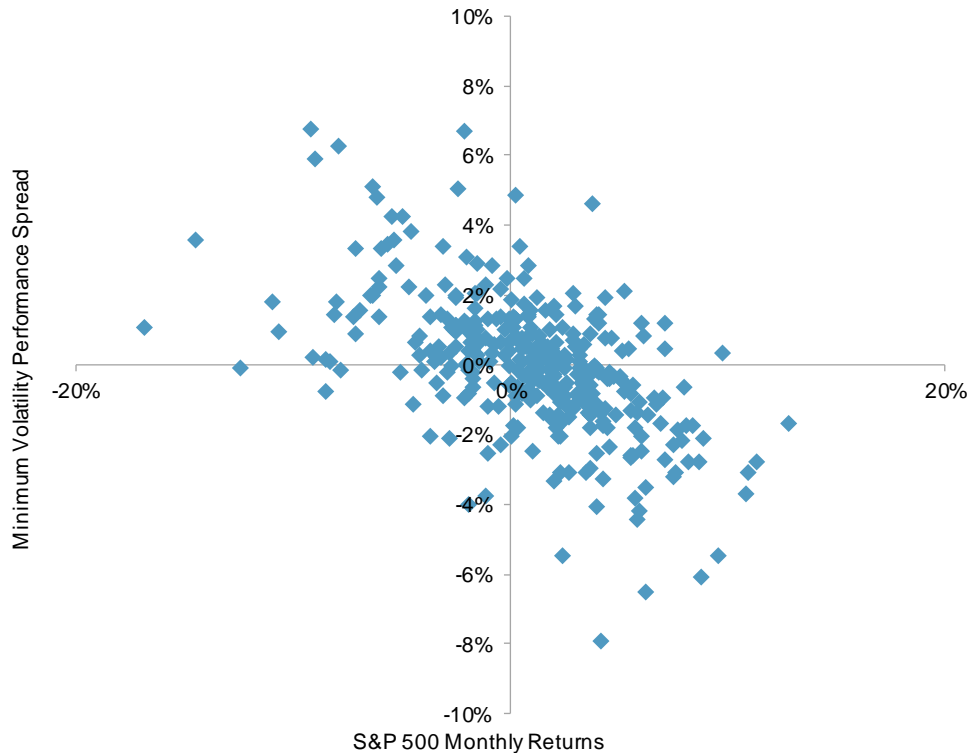
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PERFORMANCE PATTERNS

What kind of risk/return pattern does a low volatility strategy produce? Since its explicit goal is to mute other effects of market returns, results should be less extreme in both directions. In rising markets, a low volatility index should lag its benchmark; in falling markets, low volatility should decline less than the benchmark. Exhibit 4 illustrates this. We plotted the return differential between the S&P 500 Minimum Volatility Index and the S&P 500 against the monthly return of the S&P 500 from 1991 through May 2021. Relative to the S&P 500, the minimum volatility strategy generally had a positive spread in the months of market declines and a negative spread in months of market gains. Performance differentials for the S&P 500 Minimum Volatility Index, in other words, exhibited a strong inverse relationship with the performance of the S&P 500.

In rising markets, a low volatility index should lag its benchmark; in falling markets, low volatility should decline less than the benchmark.

Exhibit 4: Relative Performance of Minimum Volatility Strategy Had a Strong Inverse Relationship with the Performance of the Benchmark



Relative to the S&P 500, the minimum volatility index generally had a positive spread in the months of market decline, versus a negative spread in months of market gain.

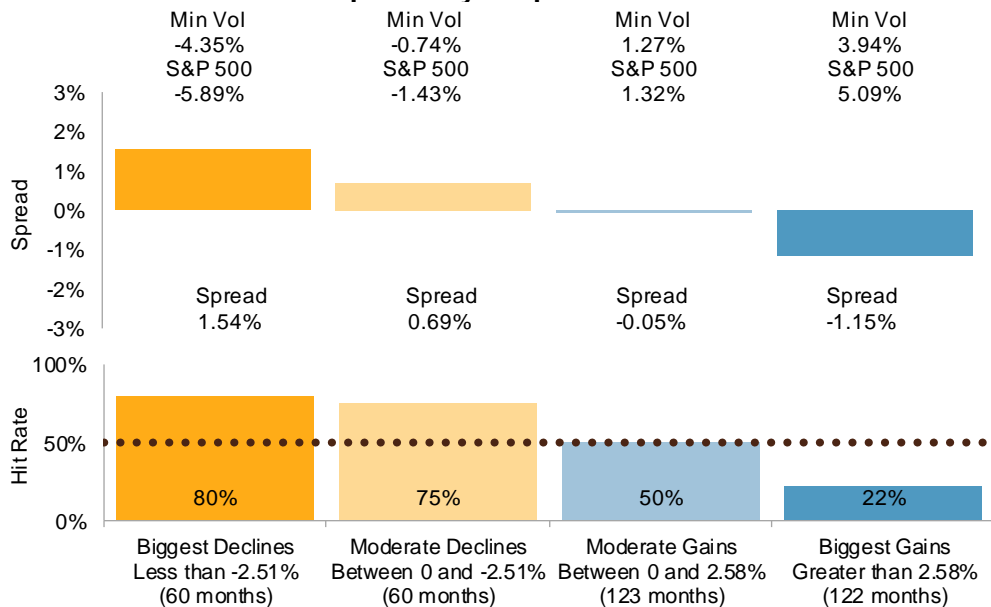
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How often and by what magnitude did the S&P 500 Minimum Volatility Index temper the performance of the market? If we rearrange the data set from Exhibit 4 to group the months into different market environments, we gain more insight into the index’s performance profile. Of the 365 months in this period, the S&P 500 rose in 245 and declined in 120. We divided both the positive and negative groups in half, separating them into large/moderate gains and declines. Examining the average performance differential and the hit rates gives us some insight into the likely behavior of the S&P Minimum Volatility Index in each of the four environments, both in the *magnitude* of moves, as well as their *direction* (see Exhibit 5).

In the worst-performing months, the S&P 500 Minimum Volatility Index outperformed 80% of the time by an average of 1.54%.

In the 60 months when the S&P 500 performed the worst (down 5.89% on average), the S&P 500 Minimum Volatility Index outperformed by an average of 1.54%, beating the S&P 500 80% of the time. Moving along the chart, the spread between the S&P 500 Minimum Volatility Index and the S&P 500 narrows, and the hit rates also decline. In the best-performing market environments, the S&P 500 Minimum Volatility Index underperformed 78% of the time by an average of 1.15%.

Exhibit 5: The S&P 500 Minimum Volatility Index Offered Protection in Down Markets but Did Not Participate Fully in Up Markets



In the best-performing months, the strategy underperformed 78% of the time by an average of 1.15%.

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The minimum volatility index attenuated the market’s return in both directions.

The minimum volatility strategy attenuated the market’s return in both directions. The performance pattern was that the index rose less when the market was up and declined less when the market was down. Though not foolproof, the strategy allowed for market *participation* during good times while also providing *protection* in bad times.

A DISPARITY IN MARKET DISPERSION

An investment strategy's success can be measured both by *frequency* and *magnitude*: how often it outperforms, and by how much. In the U.S., for example, the S&P 500 Minimum Volatility Index outperformed the S&P 500 in half of the months in our dataset.

Dispersion measures the degree to which stock return in a given market differ from one another.

Dispersion measures the degree to which stock returns in a given market differ from one another.⁷ Higher dispersion provides more opportunity for the returns of a factor index such as the S&P 500 Minimum Volatility Index to differ from the returns of a capitalization-weighted benchmark index.⁸

The periods in which the minimum volatility index outperformed have most often been periods of extreme market declines—which also happen to have above-average dispersion. Similarly, the periods in which the index has underperformed have been periods of below-average dispersion.⁹ Bad markets, during which low volatility (and other defensive indices) are designed to outperform, tend to occur in times of relatively high volatility, which is typically associated with high dispersion, allowing for a greater magnitude of outperformance.¹⁰

Higher dispersion provides more opportunity for the returns of a factor index to differ from those of a capitalization-weighted benchmark.

From January 1991 through May 2021, average monthly dispersion for the S&P 500 was 23.5%. Exhibit 8 shows that in the months of the S&P 500's worst performance, dispersion was 4% greater than average. Put simply, **the months when the S&P 500 Minimum Volatility Index was most likely to outperform tended to be months when the payoff for being right was above average; the months when it was likely to underperform tended to be months when the penalty for being wrong was below average.**

⁷ Edwards, Tim and Craig J. Lazzara, "[Dispersion: Measuring Market Opportunity](#)," S&P Dow Jones Indices, December 2013.

⁸ Chan, Fei Mei and Craig J. Lazzara, "[Gauging Differential Returns](#)," S&P Dow Jones Indices, January 2014. A similar observation applies to active management. See Lazzara, Craig, "[The Value of Skill](#)," S&P Dow Jones Indices, March 20, 2015.

⁹ Chan, Fei Mei and Craig J. Lazzara, "[The Best Offense: When Defensive Strategies Win](#)," S&P Dow Jones Indices, March 2015.

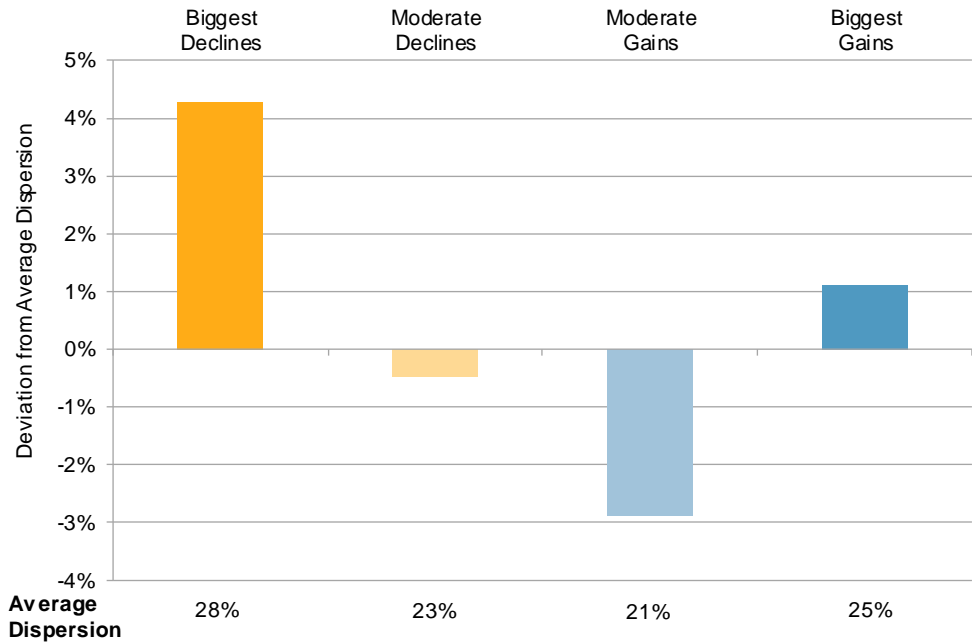
¹⁰ Edwards, Tim and Craig J. Lazzara, "[The Landscape of Risk](#)," S&P Dow Jones Indices, December 2014.

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The months when the S&P 500 Minimum Volatility Index was most likely to outperform tended to be months when the payoff for being right was above average.

Exhibit 6: Dispersion Was Highest in the Months of the Biggest Market Declines, Giving Defensive Strategies an Advantage



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RATIONALIZING THE LOW VOLATILITY ANOMALY

Leverage aversion and a “preference for lotteries” are two possible explanations for why market participants might overpay for high volatility stocks.

There are a number of non-mutually exclusive explanations for the existence of a low volatility effect or anomaly. We highlight two, both of which explain why market participants might be inclined to overpay for high volatility stocks.¹¹

One explanation is *leverage aversion*. The Capital Asset Pricing Model (CAPM) argues that a stock’s return should be proportionate to its systematic risk, or beta. Early empirical tests found that this formulation worked well for stocks with betas below 1.00, but not for higher beta stocks.¹² One explanation for this is that the CAPM assumes that all investors should own the market portfolio; if they want more risk than the market offers, they should own the market portfolio with leverage. In practice, transaction costs and regulatory constraints inhibit the use of leverage. An investor targeting a beta of 1.20 is unlikely to hold the S&P 500 with 20% leverage—instead he would buy a portfolio of stocks with a beta averaging 1.20. This creates excess demand for high beta, high volatility stocks, elevating their prices above intrinsic value. A strategy that systematically avoids such stocks is therefore likely to benefit.

¹¹ See also Edwards, Tim, Craig J. Lazzara, and Hamish Preston, “[Low Volatility: A Practitioner’s Guide](#),” S&P Dow Jones Indices, June 2018.

¹² Jensen, Black, and Scholes, op. cit.

Because low volatility strategies tend to outperform in falling markets...

A second explanation comes from behavioral finance, specifically from the cognitive bias that behavioral economists call the “preference for lotteries.” The argument is that no rational person would ever buy a lottery ticket, since the expected return of such a purchase is negative. However, we know that millions of lottery tickets are sold all over the world every day. Why do so many people behave in a way that classical economics regards as completely irrational? The behavioral argument is that some people are willing to risk a known amount of money in exchange for the possibility, however slim, of a gigantic payoff.

If this happens in a game of chance, how does it apply to financial markets? What is analogous to a lottery ticket in the stock market? The stock market’s lottery tickets are the stocks of highly volatile companies. Ultimately, they may not amount to much, but one of them could be the next Apple. Some investors are willing to pay for the chance of an improbable—but large—reward.

This tendency, which also amounts to buying volatility for volatility’s sake, drives the price of lottery-like stocks above their fair value. This means that **a portfolio that systematically excludes the most volatile stocks—**which the S&P 500 Minimum Volatility Index is designed to do—**is more likely to outperform over time.**

...they can benefit from a disparity in market dynamic—bad markets tend to have higher dispersion, allowing for larger spreads.

CONCLUSION

The low volatility anomaly is an observable phenomenon across market segments and regions. The S&P 500 Minimum Volatility Index is part of a class of strategies that explicitly seeks to generate a tempered pattern of returns—losing less when markets decline and gaining less when markets rise. Because of this design, low volatility strategies can benefit from a disparity in market dynamics; they tend to outperform in periods of relatively high dispersion. In other words, the **minimum volatility strategy has tended to be right when the payoff for being right was most advantageous.**

PERFORMANCE DISCLOSURE/BACK-TESTED DATA

The S&P 500 Minimum Volatility Index was launched November 9, 2012. All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance. The back-test calculations are based on the same methodology that was in effect on the index Launch Date. However, when creating back-tested history for periods of market anomalies or other periods that do not reflect the general current market environment, index methodology rules may be relaxed to capture a large enough universe of securities to simulate the target market the index is designed to measure or strategy the index is designed to capture. For example, market capitalization and liquidity thresholds may be reduced. Complete index methodology details are available at www.spglobal.com/spdji. Past performance of the Index is not an indication of future results. Back-tested performance reflects application of an index methodology and selection of index constituents with the benefit of hindsight and knowledge of factors that may have positively affected its performance, cannot account for all financial risk that may affect results and may be considered to reflect survivor/look ahead bias. Actual returns may differ significantly from, and be lower than, back-tested returns. Past performance is not an indication or guarantee of future results. Please refer to the methodology for the Index for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations. Back-tested performance is for use with institutions only; not for use with retail investors.

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