

## Seeking Volatility Protection Using Indices

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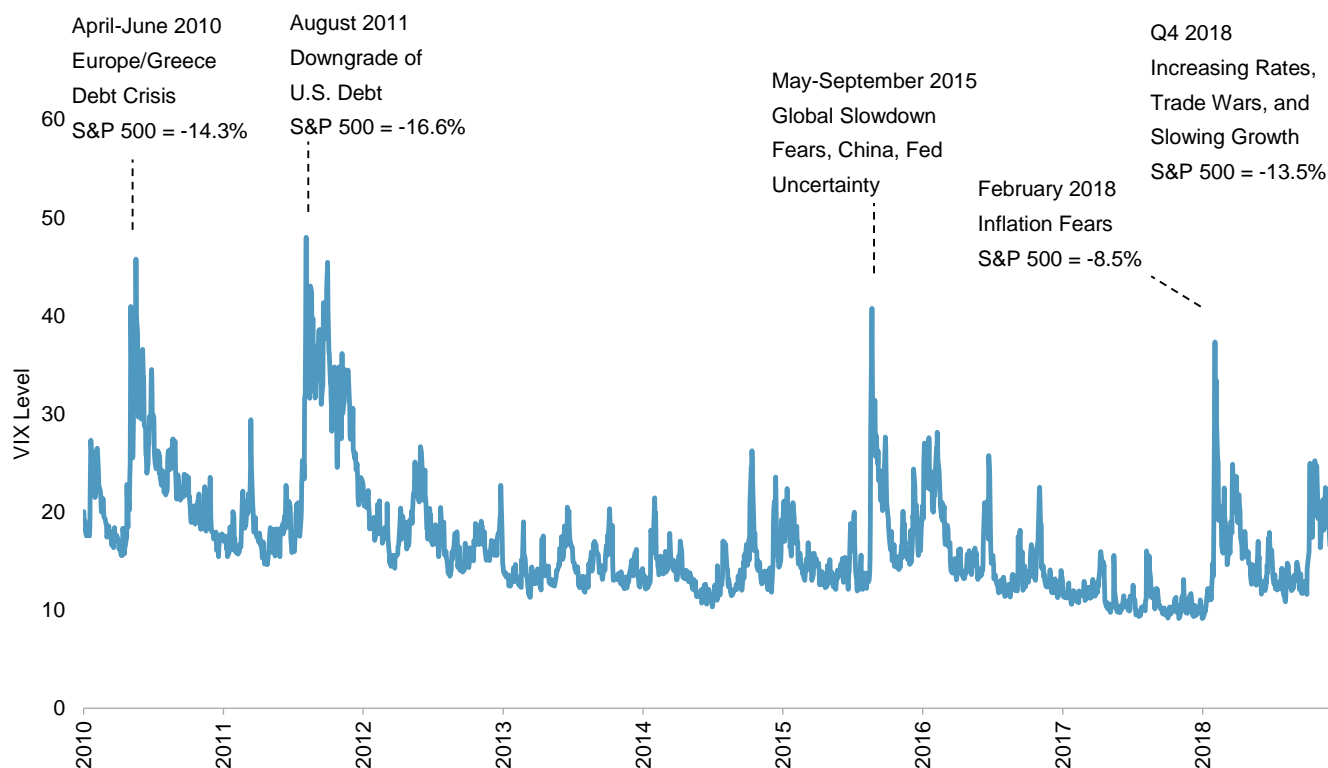
Product Management

Strategy Indices

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- Fluctuating periods of “risk-on” and “risk-off” mean that spikes in equity market volatility and large drawdowns are increasingly common in today’s economy (see Exhibit 1).
- Passive investment strategies could help position portfolios to withstand market volatility.
- S&P Dow Jones Indices (S&P DJI) offers a variety of indices specifically designed to help smooth out equity market drawdowns and improve risk-adjusted returns.
- These indices can be broadly placed into three categories: defensive equity, multi-asset, and volatility.

**Exhibit 1: Implied Volatility Spikes Have Been a Prominent Factor in the Long Bull Market**



Source: Bloomberg. Data from Jan. 1, 2010, to Dec. 31, 2018. VIX® is based on options of the S&P 500® and is the leading benchmark index to measure the market’s expectation of future volatility. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

## 1. INTRODUCTION

*With more spikes in volatility and large drawdowns likely to come in the future...*

With markets fluctuating between “risk-on” and “risk-off” environments, shifts in economic conditions can pose significant challenges for investors. Exhibit 1 shows events throughout the current market cycle causing dramatic spikes in volatility and large drawdowns. With more of these likely in the future, as our long bull market cycle ages, how do investors best position portfolios to respond?

*...how do investors best position portfolios to respond?*

Many investors are familiar with the indices that exist to gain broad market exposure in a low-cost, liquid, and transparent manner. But which passive strategies can outperform during periods of negative equity performance and increased volatility?

S&P DJI offers many indices designed to help take the sting out of equity market drawdowns and improve risk-adjusted return. In this paper, we examine such flagship indices and their performance during large equity market drawdowns, notably Q4 2018.

*S&P DJI offers many indices to help smooth out equity market drawdowns and improve risk-adjusted returns.*

For the purposes of this paper, the indices have been divided into three broad categories (defensive equity, multi-asset, and volatility) to highlight shared characteristics, key features, and risk considerations. For ease of comparison, Exhibits 2, 3, and 4 provide an overview of these categories and the corresponding indices.

**Exhibit 2: Key Features and Risk Considerations of the Three Categories of Indices**

| CATEGORY                | KEY FEATURES   | RISK CONSIDERATIONS   |
|-------------------------|--|---|
| <b>Defensive Equity</b> | <ul style="list-style-type: none"> <li>• Allocate to perceived lower risk companies</li> <li>• Tend to outperform in down markets</li> </ul>   | <ul style="list-style-type: none"> <li>• High correlation with equity markets</li> <li>• Tend to underperform in up markets</li> </ul>  |
| <b>Multi-Asset</b>      | <ul style="list-style-type: none"> <li>• Focus on building diversified portfolios of assets</li> <li>• Typically utilize a risk control or risk management mechanism</li> </ul>      | <ul style="list-style-type: none"> <li>• Diversification is no guarantee of outperformance</li> <li>• Increased correlations during stress periods</li> </ul>                   |
| <b>Volatility</b>       | <ul style="list-style-type: none"> <li>• Volatility is considered an asset class in its own right</li> <li>• Implied volatility is considered a forward-looking indicator</li> </ul> | <ul style="list-style-type: none"> <li>• Highly volatile asset class with asymmetric payoffs</li> <li>• May not be a reliable indicator of equity market performance</li> </ul> |

Source: S&P Dow Jones Indices. Table is provided for illustrative purposes.

Exhibit 3 lists the specific indices that will be covered in this paper. Each description includes the allocation metric and performance characteristics of each index series.

| <b>Exhibit 3: Indices in Each Category</b> |   |   |
|--|---|---|
| <b>CATEGORY</b>                            | <b>INDEX SERIES</b>                                     | <b>DESCRIPTION</b>  |
| <b>Defensive Equity</b>                    | <a href="#">S&amp;P Low Volatility Indices</a>          | Allocate to stocks with lower realized volatility. The indices tend to outperform in down markets but underperform in up markets.   |
|  | <a href="#">S&amp;P Quality Indices</a>                 | Utilize a three-pronged approach to identify high-quality companies. The indices tend to outperform in down markets but underperform in up markets.                                     |
|  | <a href="#">S&amp;P Dividend Aristocrats® Indices</a>   | Allocate to companies that have consistently grown their dividends over several years. The indices tend to outperform in down markets but underperform in up markets.                   |
| <b>Multi-Asset</b>                         | <a href="#">S&amp;P Risk Parity Indices</a>             | Equalize asset class risk contribution in order to provide a smoother return profile that is less exposed to equity market drawdowns.   |
|  | <a href="#">S&amp;P Daily Risk Control Indices</a>      | Dynamically allocate between an equity index and cash to maintain a specific volatility target and thus provide a stable level of volatility in all market environments.                |
|  | <a href="#">S&amp;P Daily Risk Control 2 Indices</a>    | Dynamically allocate between an equity index and a bond index to maintain a specific volatility target and thus provide a stable level of volatility in all market environments.        |
|  | <a href="#">S&amp;P Managed Risk Indices</a>            | Dynamically allocate between an equity index and cash, keeping a fixed allocation to a bond index. These indices aim to participate in up markets, while muting losses in down markets. |
|  | <a href="#">S&amp;P Managed Risk 2.0 Indices</a>        | Simulate a downside-protected portfolio that utilizes a framework that includes a volatility target and a synthetic option overlay to hedge the portfolio's downside risk.              |
| <b>Volatility</b>                          | <a href="#">S&amp;P Strategic Global Macro Indices</a>  | Utilize a trend-following algorithm to establish long or short positions. The indices tend to be low or negatively correlated to most asset classes.                                    |
|  | <a href="#">Cboe S&amp;P 500 Buffer Protect Indices</a> | Designed to provide target outcome returns to an equity index. The indices incorporate a buffer to help protect against losses, while capping upside participation.                     |
|  | <a href="#">S&amp;P Dynamic VEQTOR Indices</a>          | Dynamically allocate between an equity index and volatility, based on a combination of realized and implied volatility. Additionally, the indices incorporate a stop-loss feature.      |

Source: S&P Dow Jones Indices. Table is provided for illustrative purposes.

The recent round of market volatility helped to illustrate the divergence in risk and return attributes across index products. Exhibit 4 shows the Q4 2018 and full-year 2018 performance for the indices discussed in this paper. The majority of the indices presented are a subset of a larger index series composed of indices spanning different geographies and market capitalizations, as shown in Exhibit 3. In this case, the large-cap [S&P 500](#) was selected as the benchmark.

**Exhibit 4: Performance of Defensive Equity, Multi-Asset, and Volatility Indices**

| CATEGORY                                  | INDEX   | Q4 2018 PERFORMANCE (%)    | FULL-YEAR 2018 PERFORMANCE (%) |
|---|---|----------------------------|--------------------------------|
| Benchmark                                 | S&P 500   | -13.5                      | -4.4                           |
| Defensive Equity                          | S&P 500 Low Volatility Index                      | -5.2                       | 0.3                            |
|   | S&P 500 Quality Index                             | -14.8                      | -6.8                           |
|   | S&P 500 Dividend Aristocrats                      | -8.6                       | -2.7                           |
|   | S&P 500 Risk Parity Index – 10% Target Volatility | -4.4                       | -4.0                           |
|   | S&P 500 Risk Parity Index – 12% Target Volatility | -5.4                       | -5.2                           |
|   | S&P 500 Risk Parity Index – 15% Target Volatility | -6.8                       | -6.9                           |
|   | S&P 500 Daily Risk Control 5% Index               | -5.3                       | 0.6                            |
|   | S&P 500 Daily Risk Control 10% Index              | -10.9                      | -1.3                           |
|   | S&P 500 Daily Risk Control 15% Index              | -14.3                      | -4.2                           |
|   | Multi-Asset                                       | S&P 500 Daily RC2 8% Index | -6.9                           |
| S&P 500 Daily RC2 10% Index               |   | -8.2                       | -0.8                           |
| S&P 500 Daily RC2 15% Index               |   | -11.4                      | -3.3                           |
| S&P 500 Managed Risk Index – Conservative |   | -5.3                       | -1.6                           |
| S&P 500 Managed Risk Index – Moderate     |   | -7.6                       | -2.1                           |
| S&P 500 Managed Risk Index – Aggressive   |   | -10.0                      | -2.9                           |
| S&P 500 Managed Risk 2.0 Index            |   | -10.6                      | -3.3                           |
| S&P Systematic Global Macro Index (SGMI)  |   | -7.5                       | -4.8                           |
| Volatility                                | Cboe Buffer Protect Index                         | -8.0                       | -1.9                           |
|   | S&P 500 Dynamic VEQTOR Index                      | -10.5                      | -1.1                           |

*The recent market volatility helped to illustrate the divergence in risk/return attributes across index products.*

Source: S&P Dow Jones Indices LLC. Data from Dec. 29, 2017, to Dec. 31, 2018. Past performance is no guarantee of future results. Table 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.

## 2. DEFENSIVE EQUITY

This category includes three index series that demonstrate defensive characteristics: S&P Low Volatility Indices, S&P Quality Indices, and S&P Dividend Aristocrats Indices. These indices are designed to track what are perceived as lower risk companies that tend to outperform in down markets (although at the expense of expected underperformance on the upside). Selection metrics for these indices are either fundamental (analyzing

*Defensive equity strategies seek to track lower risk companies that tend to outperform in down markets.*

financial statements to identify companies with favorable attributes) or quantitative (identifying stocks that exhibit low volatility).

## 2a. S&P Low Volatility Indices

The S&P Low Volatility Indices seek to track stocks with lower realized volatility, exploiting the “low volatility anomaly.” While contradictory to modern portfolio theory, favoring low volatility stocks over high volatility stocks has shown evidence of higher risk-adjusted returns and persistence over time. Furthermore, low volatility indices can help minimize downside risk by avoiding highly volatile stocks and favoring those with more stable performance.

Exhibit 5 shows that the [S&P 500 Low Volatility Index](#) achieved a higher long-term risk-adjusted return than the S&P 500. Confirming its defensive nature, it consistently beat the S&P 500 during periods of large equity market drawdowns. Additionally, the index outperformed about 83% of the time when the S&P 500 recorded a down month. It had a strong Q4 2018, as companies exhibiting lower volatility outperformed, and the index benefited from the lack of constraints imposed on tracking error.

*The S&P Low Volatility Indices can help minimize downside risk by avoiding volatile stocks.*

*The S&P 500 Low Volatility Index had strong Q4 2018 performance relative to the broad market.*

**Exhibit 5: Long-Term Statistics – S&P 500 Low Volatility Index**

| STATISTIC   | S&P 500 | S&P 500 LOW VOLATILITY INDEX |
|---|---------|------------------------------|
| Annualized Return (%)   | 7.1     | 8.5                          |
| Annualized Volatility (%)                                     | 19.8    | 14.7                         |
| Sharpe Ratio  | 0.40    | 0.57                         |
| Maximum Drawdown (%)  | -55.3   | -40.4                        |
| Up-Month Outperformance (%)                                   | -       | 31.3                         |
| Down-Month Outperformance (%)                                 | -       | 83.3                         |
| <b>RETURN IN PERIODS OF LARGE EQUITY MARKET DRAWDOWNS (%)</b> |         |                              |
| Global Financial Crisis (October 2007 – February 2009)        | -50.2   | -33.4                        |
| Europe/Greece Debt Crisis (April – June 2010)                 | -14.3   | -6.9                         |
| Downgrade of U.S. Debt (August 2011)                          | -16.6   | -11.6                        |
| China’s Black Monday (May – September 2015)                   | -7.1    | -2.0                         |
| Inflation Fears (February 2018)                               | -8.5    | -8.1                         |
| Q4 2018 (October – December 2018)                             | -13.5   | -5.2                         |

Source: S&P Dow Jones Indices LLC. Data from Dec. 29, 2006, to Dec. 31, 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Table 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.

## 2b. S&P Quality Indices

*The S&P Quality Indices identify higher quality companies that tend to outperform in down markets.*

The S&P Quality Indices seek exposure to the quality premium that has shown evidence of long-term outperformance. Quality is measured via a three-pronged approach that focuses on profitability, earnings sustainability, and financial robustness. Together, these measures have generally shielded companies when economic growth is weak, giving them slightly more protection during downturns. This has been confirmed historically, as the indices exhibited favorable risk-adjusted returns and lower maximum drawdowns than their respective benchmarks.

The [S&P 500 Quality Index](#) has shown attractive risk-adjusted returns over the long term. It notably has outperformed about 77% of the time when the S&P 500 recorded a down month, as well as about 50% of the time in an up month. While generally favorable during large equity market drawdowns, the index underperformed in Q4 2018 (see Exhibit 6). This was mainly because the index was overweight the Information Technology sector (Information Technology had about a 34% weight and contributed approximately -5% to the return).

**Exhibit 6: Long-Term Statistics – S&P 500 Quality Index**

| STATISTIC  | S&P 500 | S&P 500 QUALITY INDEX |
|--|---------|-----------------------|
| Annualized Return (%)                                  | 7.1     | 8.8                   |
| Annualized Volatility (%)                              | 19.8    | 18.5                  |
| Sharpe Ratio   | 0.40    | 0.50                  |
| Maximum Drawdown (%)                                   | -55.3   | -47.8                 |
| Up-Month Outperformance (%)                            | -       | 49.0                  |
| Down-Month Outperformance (%)                          | -       | 77.1                  |
| RETURN IN PERIODS OF LARGE EQUITY MARKET DRAWDOWNS (%) |         |                       |
| Global Financial Crisis (October 2007 – February 2009) | -50.2   | -42.7                 |
| Europe/Greece Debt Crisis (April – June 2010)          | -14.3   | -12.8                 |
| Downgrade of U.S. Debt (August 2011)                   | -16.6   | -14.4                 |
| China's Black Monday (May – September 2015)            | -7.1    | -7.2                  |
| Inflation Fears (February 2018)                        | -8.5    | -8.0                  |
| Q4 2018 (October – December 2018)                      | -13.5   | -14.8                 |

*The S&P 500 Quality Index underperformed in Q4 2018, largely due to being overweight Information Technology.*

Source: S&P Dow Jones Indices LLC. Data from Dec. 29, 2006, to Dec. 31, 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Table 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.

## 2c. S&P Dividend Aristocrats Indices

*Consistently growing dividends can be a sign of corporate maturity and strength.*

The S&P Dividend Aristocrats Indices allocate to companies that have consistently grown their dividends over several years. Such track records are a sign of corporate maturity and balance sheet strength—indications of the ability to withstand periods of market volatility.

The [S&P 500 Dividend Aristocrats](#) exhibited higher long-term risk-adjusted returns than the S&P 500, which was mainly driven by a higher annualized return. The defensive qualities are evident historically, as the S&P 500 Dividend Aristocrats has generally outperformed during periods of large equity market drawdowns and about 73% of the time when the S&P 500 recorded a down month. The index had a favorable Q4 2018, posting material outperformance (see Exhibit 7).

*The S&P 500 Dividend Aristocrats outperformed the S&P 500 in Q4 2018.*

**Exhibit 7: Long-Term Statistics – S&P 500 Dividend Aristocrats**

| STATISTIC   | S&P 500 | S&P 500 DIVIDEND ARISTOCRATS |
|---|---------|------------------------------|
| Annualized Return (%)   | 7.1     | 9.6                          |
| Annualized Volatility (%)                                     | 19.8    | 18.6                         |
| Sharpe Ratio  | 0.40    | 0.54                         |
| Maximum Drawdown (%)  | -55.3   | -48.7                        |
| Up-Month Outperformance (%)                                   | -       | 45.8                         |
| Down-Month Outperformance (%)                                 | -       | 72.9                         |
| <b>RETURN IN PERIODS OF LARGE EQUITY MARKET DRAWDOWNS (%)</b> |         |                              |
| Global Financial Crisis (October 2007 – February 2009)        | -50.2   | -41.7                        |
| Europe/Greece Debt Crisis (April – June 2010)                 | -14.3   | -11.7                        |
| Downgrade of U.S. Debt (August 2011)                          | -16.6   | -14.7                        |
| China's Black Monday (May – September 2015)                   | -7.1    | -5.4                         |
| Inflation Fears (February 2018)                               | -8.5    | -8.0                         |
| Q4 2018 (October – December 2018)                             | -13.5   | -8.6                         |

Source: S&P Dow Jones Indices LLC. Data from Dec. 29, 2006, to Dec. 31, 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Table 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.

## 3. MULTI-ASSET

*Multi-asset indices seek diversification by allocating to complementary asset classes.*

Multi-asset indices combine low-correlated asset classes (such as stocks and bonds) in order to create broadly diversified portfolios that strive to improve risk-adjusted return, lower volatility, and reduce drawdowns. These indices follow a rules-based asset allocation program that determines the asset class weights. Additionally, the majority of indices in this category utilize a risk management or risk control mechanism.

### 3a. S&P Risk Parity Indices

*The S&P Risk Parity Indices equalize the risk contribution of each asset class to help maximize diversification benefits.*

The S&P Risk Parity Indices allocate across three asset classes: equities, fixed income, and commodities. The allocation methodology is designed to equalize the risk contribution of each asset class in order to maximize the benefits of diversification. No single asset class dominates the overall risk and return, resulting in a smoother return profile that is less exposed to equity market drawdowns. The index series comprises three indices with volatility targets of 10%, 12%, and 15%.

The S&P Risk Parity Indices exhibited attractive long-term risk-adjusted return and favorable performance during market downturns. These indices posted material outperformance during Q4 2018 (see Exhibit 8). This was largely due to the weighting scheme, which aims to balance the asset class risk exposure (i.e., the fixed income component had sufficient voice to offset losses).

**Exhibit 8: Long-Term Statistics – S&P Risk Parity Indices**

| STATISTIC   | S&P 500 | S&P RISK PARITY INDEX – 10% TARGET VOLATILITY | S&P RISK PARITY INDEX – 12% TARGET VOLATILITY | S&P RISK PARITY INDEX – 15% TARGET VOLATILITY |
|---|---------|---|---|---|
| Annualized Return (%)   | 7.1     | 4.2   | 4.8   | 5.8   |
| Annualized Volatility (%)                                     | 19.8    | 7.9   | 9.6   | 12.2  |
| Sharpe Ratio  | 0.40    | 0.44  | 0.44  | 0.45  |
| Maximum Drawdown (%)  | -55.3   | -30.1   | -35.6   | -43.3   |
| Up-Month Outperformance (%)                                   | -       | 13.5  | 17.7  | 26.0  |
| Down-Month Outperformance (%)                                 | -       | 83.3  | 79.2  | 77.1  |
| <b>RETURN IN PERIODS OF LARGE EQUITY MARKET DRAWDOWNS (%)</b> |         |   |   |   |
| Global Financial Crisis (October 2007 – February 2009)        | -50.2   | -21.7   | -26.1   | -32.5   |
| Europe/Greece Debt Crisis (April – June 2010)                 | -14.3   | -0.4  | -0.5  | -0.7  |
| Downgrade of U.S. Debt (August 2011)                          | -16.6   | -1.7  | -2.1  | -2.6  |
| China’s Black Monday (May – September 2015)                   | -7.1    | -5.8  | -6.9  | -8.5  |
| Inflation Fears (February 2018)                               | -8.5    | -3.5  | -4.2  | -5.2  |
| Q4 2018 (October – December 2018)                             | -13.5   | -4.4  | -5.4  | -6.8  |

*These indices outperformed the S&P 500 in Q4 2018 across all volatility targets.*

Source: S&P Dow Jones Indices LLC. Data from Dec. 29, 2006, to Dec. 31, 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Table 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.



### 3b. S&P Daily Risk Control Indices

*The S&P Daily Control Indices reduce exposure to the underlying index as volatility increases to reduce drawdowns.*

The S&P Daily Risk Control Indices use dynamic asset allocation to maintain a specific volatility target. The goals of this index series are to provide a stable level of volatility in all market environments and to limit drawdowns. These indices have two components: an underlying index (e.g., the S&P 500) and a cash component. When volatility increases, the allocation to the underlying index is decreased and the allocation to cash is increased (and vice versa).

The S&P Daily Risk Control Indices exhibited attractive long-term risk-adjusted performance and have generally beaten the S&P 500 during periods of large equity market drawdowns (see Exhibit 9). The indices with volatility targets of 5% and 10% outperformed in Q4 2018, mainly due to their conservative risk tolerance and, as volatility increased, to reducing the allocation to the S&P 500 and placing it into cash. The [S&P Daily Risk Control 15% Index](#) underperformed in Q4 2018, as it was more levered due to its more aggressive risk tolerance and suffered larger losses early in the quarter.

*The 5% and 10% volatility target indices outperformed the S&P 500 in Q4...*

**Exhibit 9: Long-Term Statistics – S&P 500 Daily Risk Control Indices**

| STATISTIC   | S&P 500 | S&P 500 DAILY RISK CONTROL 5% INDEX | S&P 500 DAILY RISK CONTROL 10% INDEX | S&P 500 DAILY RISK CONTROL 15% INDEX |
|---|---------|-------------------------------------|--------------------------------------|--------------------------------------|
| Annualized Return (%)   | 7.1     | 3.8                                 | 6.3                                  | 7.9                                  |
| Annualized Volatility (%)                                     | 19.8    | 5.1                                 | 10.3                                 | 14.8                                 |
| Sharpe Ratio  | 0.40    | 0.57                                | 0.55                                 | 0.53                                 |
| Maximum Drawdown (%)  | -55.3   | -8.6                                | -19.7                                | -30.2                                |
| Up-Month Outperformance (%)                                   | -       | 2.1                                 | 17.7                                 | 50.0                                 |
| Down-Month Outperformance (%)                                 | -       | 97.9                                | 81.3                                 | 47.9                                 |
| <b>RETURN IN PERIODS OF LARGE EQUITY MARKET DRAWDOWNS (%)</b> |         |                                     |                                      |                                      |
| Global Financial Crisis (October 2007 – February 2009)        | -50.2   | -7.0                                | -16.9                                | -26.1                                |
| Europe/Greece Debt Crisis (April – June 2010)                 | -14.3   | -3.6                                | -7.2                                 | -10.7                                |
| Downgrade of U.S. Debt (August 2011)                          | -16.6   | -5.5                                | -10.9                                | -16.0                                |
| China's Black Monday (May – September 2015)                   | -7.1    | -3.7                                | -7.4                                 | -11.1                                |
| Inflation Fears (February 2018)                               | -8.5    | -3.5                                | -7.0                                 | -10.0                                |
| Q4 2018 (October – December 2018)                             | -13.5   | -5.3                                | -10.9                                | -14.3                                |

Source: S&P Dow Jones Indices LLC. Data from Dec. 29, 2006, to Dec. 31, 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Table 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.

*...whereas the 15% target volatility underperformed.*

### 3c. S&P Daily Risk Control 2 (RC2) Indices

The S&P Daily RC2 Indices replace the standard cash component used in the S&P Daily Risk Control Indices with a liquid bond index. The allocation methodology assigns weights to either the underlying equity index or the bond index, so that the target volatility can be achieved. Similar to the S&P Daily Risk Control Indices, the goals of this index series are to provide a stable level of volatility and to limit drawdowns.

*The S&P Daily RC2 Indices dynamically allocate between an equity index and a liquid bond index.*

Over the long term, the S&P Daily RC2 Indices outperformed the S&P 500 on a risk-adjusted basis—achieving similar or higher returns with lower volatility (see Exhibit 10). The indices consistently outperformed during large equity market drawdowns. Outperformance in Q4 2018 can be attributed to their conservative risk tolerance (for the 8% and 10% volatility targets) and the fact that the allocation to the S&P 500 was reduced in early October 2018 and replaced by the liquid bond index (which provided offsetting returns).

**Exhibit 10: Long-Term Statistics – S&P 500 Daily Risk Control 2 Indices**

| STATISTIC   | S&P 500 | S&P 500 DAILY RC2 8% INDEX | S&P 500 DAILY RC2 10% INDEX | S&P 500 DAILY RC2 15% INDEX |
|---|---------|----------------------------|-----------------------------|-----------------------------|
| Annualized Return (%)   | 7.1     | 7.3                        | 7.4                         | 8.5                         |
| Annualized Volatility (%)                                     | 19.8    | 8.2                        | 10.5                        | 13.0                        |
| Sharpe Ratio  | 0.40    | 0.78                       | 0.65                        | 0.62                        |
| Maximum Drawdown (%)  | -55.3   | -14.3                      | -17.1                       | -26.7                       |
| Up-Month Outperformance (%)                                   | -       | 8.3                        | 14.6                        | 25.0                        |
| Down-Month Outperformance (%)                                 | -       | 87.5                       | 83.3                        | 66.7                        |
| <b>RETURN IN PERIODS OF LARGE EQUITY MARKET DRAWDOWNS (%)</b> |         |                            |                             |                             |
| Global Financial Crisis (October 2007 – February 2009)        | -50.2   | -11.7                      | -8.2                        | -22.6                       |
| Europe/Greece Debt Crisis (April – June 2010)                 | -14.3   | -4.3                       | -13.1                       | -10.0                       |
| Downgrade of U.S. Debt (August 2011)                          | -16.6   | -7.9                       | -10.3                       | -15.6                       |
| China’s Black Monday (May – September 2015)                   | -7.1    | -5.5                       | -6.8                        | -6.7                        |
| Inflation Fears (February 2018)                               | -8.5    | -5.9                       | -6.9                        | -7.7                        |
| Q4 2018 (October – December 2018)                             | -13.5   | -6.9                       | -8.2                        | -11.4                       |

*These indices outperformed the S&P 500 in Q4 2018 across all volatility targets.*

Source: S&P Dow Jones Indices LLC. Data from Dec. 29, 2006, to Dec. 31, 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Table 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.

### 3d. S&P Managed Risk Indices

*The S&P Managed Risk Indices dynamically allocate between equity and cash based on market sentiment.*

The S&P Managed Risk Indices aim to participate in up markets while muting losses in down markets. This is achieved by dynamically allocating between an underlying equity index and cash, while maintaining a fixed allocation to an underlying bond index. The mechanism to allocate between the equity index and cash is based on a market sentiment indicator (realized volatility on equities and bonds). Numerous versions of these indices exist to cater to the different risk tolerances of investors.

The S&P 500 Managed Risk Indices have had attractive long-term risk-adjusted performance and have tended to outperform in down markets (see Exhibit 11). The indices outperformed in Q4 2018 for two reasons. First, the allocation to the equity index was reduced and placed into cash, driven by the market sentiment indicator. Second, the fixed income component offset losses by posting positive performance over the quarter.

**Exhibit 11: Long-Term Statistics – S&P 500 Managed Risk Indices**

| STATISTIC   | S&P 500 | S&P 500 MANAGED RISK INDEX – CONSERVATIVE | S&P 500 MANAGED RISK INDEX – MODERATE | S&P 500 MANAGED RISK INDEX – AGGRESSIVE |
|---|---------|---|---------------------------------------|---|
| Annualized Return (%)   | 7.1     | 5.9                                       | 6.5                                   | 7.0                                     |
| Annualized Volatility (%)                                     | 19.8    | 6.2                                       | 8.4                                   | 10.8                                    |
| Sharpe Ratio  | 0.40    | 0.82                                      | 0.69                                  | 0.59                                    |
| Maximum Drawdown (%)  | -55.3   | -13.2                                     | -17.8                                 | -22.8                                   |
| Up-Month Outperformance (%)                                   | -       | 6.3                                       | 4.2                                   | 3.1                                     |
| Down-Month Outperformance (%)                                 | -       | 97.9                                      | 97.9                                  | 93.8                                    |
| <b>RETURN IN PERIODS OF LARGE EQUITY MARKET DRAWDOWNS (%)</b> |         |   |                                       |   |
| Global Financial Crisis (October 2007 – February 2009)        | -50.2   | -11.1                                     | -15.3                                 | -19.9                                   |
| Europe/Greece Debt Crisis (April – June 2010)                 | -14.3   | -4.7                                      | -6.9                                  | -9.0                                    |
| Downgrade of U.S. Debt (August 2011)                          | -16.6   | -5.8                                      | -8.3                                  | -10.7                                   |
| China's Black Monday (May – September 2015)                   | -7.1    | -3.9                                      | -5.5                                  | -7.1                                    |
| Inflation Fears (February 2018)                               | -8.5    | -4.2                                      | -5.5                                  | -6.8                                    |
| Q4 2018 (October – December 2018)                             | -13.5   | -5.3                                      | -7.6                                  | -10.0                                   |

Source: S&P Dow Jones Indices LLC. Data from Dec. 29, 2006, to Dec. 31, 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Table 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.

*The indices outperformed in Q4 2018 because the allocation to equity was reduced and fixed income offset losses.*

### 3e. S&P Managed Risk 2.0 Indices

The S&P Managed Risk 2.0 Indices are designed to lower drawdowns and provide a stable volatility profile, while allowing for higher participation in upside performance. This is achieved by dynamically allocating between an underlying equity index, an underlying fixed income index, and cash, based on the realized volatilities of the equity and fixed income indices. The indices include a volatility target and synthetic option overlays to hedge the portfolio’s downside risk.

*The S&P Managed Risk 2.0 Indices include a volatility target and synthetic option overlay to hedge the downside.*

The [S&P 500 Managed Risk 2.0 Index](#) outperformed the S&P 500 but still posted double-digit losses in Q4 2018 (see Exhibit 12); however, much of this can be attributed to its relatively high volatility target of 22%. Further downside was likely muted, as the weight of the equity component fell during the quarter, averaging approximately 50% in December 2018.

*The S&P Managed Risk 2.0 Index outperformed in Q4 2018...*

**Exhibit 12: Long-Term Statistics – S&P 500 Managed Risk 2.0 Index**

| STATISTIC   | S&P 500 | S&P MANAGED RISK 2.0 INDEX |
|---|---------|----------------------------|
| Annualized Return (%)   | 7.1     | 8.3                        |
| Annualized Volatility (%)                                     | 19.8    | 11.7                       |
| Sharpe Ratio  | 0.40    | 0.66                       |
| Maximum Drawdown (%)  | -55.3   | -18.2                      |
| Up-Month Outperformance (%)                                   | -       | 26.0                       |
| Down-Month Outperformance (%)                                 | -       | 70.8                       |
| <b>RETURN IN PERIODS OF LARGE EQUITY MARKET DRAWDOWNS (%)</b> |         |                            |
| Global Financial Crisis (October 2007 – February 2009)        | -50.2   | -14.8                      |
| Europe/Greece Debt Crisis (April – June 2010)                 | -14.3   | -9.3                       |
| Downgrade of U.S. Debt (August 2011)                          | -16.6   | -14.0                      |
| China’s Black Monday (May – September 2015)                   | -7.1    | -6.1                       |
| Inflation Fears (February 2018)                               | -8.5    | -8.2                       |
| Q4 2018 (October – December 2018)                             | -13.5   | -10.6                      |

*...but posted double-digit losses due to its high volatility target (22%).*

Source: S&P Dow Jones Indices LLC. Data from Dec. 29, 2006, to Dec. 31, 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Table 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.

### 3f. S&P Strategic Global Macro Indices

The [S&P SGMI](#) is a trend-following strategy that seeks to track the prices of a globally diversified portfolio of commodities, foreign exchange, and financial futures contracts. Its trend-following algorithm is highly flexible, assessing each constituent individually to establish a long or short position. The historical returns of the index have exhibited low or negative correlations to most asset classes, offering diversification during bear markets.

*The S&P SGMI permits long and short positioning to take advantage of positive and negative trends.*

The S&P SGMI exhibited attractive long-term risk-adjusted performance. The index posted positive performance during the global financial crisis. The S&P SGMI posted negative performance in Q4 2018 but outperformed the S&P 500 (see Exhibit 13). The losses were spread across all asset classes with the exception of foreign exchange, which posted positive performance.

**Exhibit 13: Long-Term Statistics – S&P SGMI**

| STATISTIC   | S&P 500 | S&P SGMI |
|---|---------|----------|
| Annualized Return (%)   | 7.1     | 6.5      |
| Annualized Volatility (%)                                     | 19.8    | 11.1     |
| Sharpe Ratio  | 0.40    | 0.54     |
| Maximum Drawdown (%)  | -55.3   | -23.8    |
| Up-Month Outperformance (%)                                   | -       | 29.2     |
| Down-Month Outperformance (%)                                 | -       | 81.3     |
| <b>RETURN IN PERIODS OF LARGE EQUITY MARKET DRAWDOWNS (%)</b> |         |          |
| Global Financial Crisis (October 2007 – February 2009)        | -50.2   | 31.8     |
| Europe/Greece Debt Crisis (April – June 2010)                 | -14.3   | -1.1     |
| Downgrade of U.S. Debt (August 2011)                          | -16.6   | -3.0     |
| China's Black Monday (May – September 2015)                   | -7.1    | -5.5     |
| Inflation Fears (February 2018)                               | -8.5    | -7.0     |
| Q4 2018 (October – December 2018)                             | -13.5   | -7.5     |

*The S&P SGMI posted negative performance in Q4 2018 but still outperformed the S&P 500.*

Source: S&P Dow Jones Indices LLC. Data from Dec. 29, 2006, to Dec. 31, 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Table 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.

## 4. VOLATILITY

Volatility has evolved into its own asset class with interesting attributes. These indices can offer attractive risk-adjusted performance, uncorrelated returns, and downside protection. Indices within this category either invest directly in volatility or use it as an allocation signal.

*Volatility indices either invest directly in volatility or use it as an allocation signal.*

#### 4a. Cboe S&P 500 Buffer Protect Index Series

The Cboe S&P 500 Buffer Protect Index® Series is a composite of 12 monthly series (January through December; equally weighted) that are designed to provide target outcome returns to an equity index. Each monthly series "buffer protects" against the first 10% of losses in the S&P 500 over a set period of time, while still providing the opportunity for growth to a maximum predetermined cap level.

*The Cboe S&P 500 Buffer Protect Indices "buffer protect" against the first 10% of losses in the underlying index.*

Each monthly series has a unique annual roll date that occurs within its corresponding month (e.g., the Cboe S&P 500 Buffer Protect Index January Series rolls in January) when the maximum cap level is determined. It is important to note that the buffered protection only fully applies if the index is held for the entire year (from one annual roll date to the next), otherwise additional mark-to-market losses may be incurred.

The index consistently beat the S&P 500 during periods of large equity market drawdowns; it outperformed in Q4 2018, as the 10% buffer muted losses (see Exhibit 14).

**Exhibit 14: Long-Term Statistics – Cboe S&P 500 Buffer Protect Index**

| STATISTIC   | S&P 500 | CBOE S&P 500 BUFFER PROTECT INDEX |
|---|---------|-----------------------------------|
| Annualized Return (%)   | 7.1     | 5.1                               |
| Annualized Volatility (%)                                     | 19.8    | 13.9                              |
| Sharpe Ratio  | 0.40    | 0.36                              |
| Maximum Drawdown (%)  | -55.3   | -43.8                             |
| Up-Month Outperformance (%)                                   | -       | 12.5                              |
| Down-Month Outperformance (%)                                 | -       | 97.9                              |
| <b>RETURN IN PERIODS OF LARGE EQUITY MARKET DRAWDOWNS (%)</b> |         |                                   |
| Global Financial Crisis (October 2007 – February 2009)        | -50.2   | -39.0                             |
| Europe/Greece Debt Crisis (April – June 2010)                 | -14.3   | -8.3                              |
| Downgrade of U.S. Debt (August 2011)                          | -16.6   | -11.4                             |
| China's Black Monday (May – September 2015)                   | -7.1    | -4.1                              |
| Inflation Fears (February 2018)                               | -8.5    | -3.7                              |
| Q4 2018 (October – December 2018)                             | -13.5   | -8.0                              |

*The Cboe S&P 500 Buffer Protect Index outperformed in Q4 2018, as the 10% buffer muted losses.*

Source: S&P Dow Jones Indices LLC. Data from Dec. 29, 2006, to Dec. 31, 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Table 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.

## 4b. S&P 500 Dynamic VEQTOR Index

*The S&P 500 Dynamic VEQTOR Index dynamically allocates between equity and volatility, and includes a stop-loss feature...*

The S&P 500 Dynamic VEQTOR Index has three components: equity, volatility, and cash. The index dynamically allocates between the equity and (long) volatility components based on a combination of realized and implied volatility. Additionally, there is a stop-loss feature where the index goes 100% into cash if losses over the prior five days are greater than or equal to 2%.

*...where the index goes 100% into cash if losses over the prior five days are greater than or equal to 2%.*

The [S&P 500 Dynamic VEQTOR Index](#) achieved a higher long-term return with almost half the volatility compared with the S&P 500. The index posted positive performance during the global financial crisis and during the inflation fears in early 2018 (see Exhibit 15). The index slightly outperformed the S&P 500 in Q4 2018, maintaining a fairly high equity weight, but moving 100% into cash on a few occasions as the stop-loss feature was triggered.

**Exhibit 15: Long-Term Statistics – S&P 500 Dynamic VEQTOR Index**

| STATISTIC   | S&P 500 | S&P 500 DYNAMIC VEQTOR INDEX |
|---|---------|------------------------------|
| Annualized Return (%)   | 7.1     | 8.8                          |
| Annualized Volatility (%)                                     | 19.8    | 10.2                         |
| Sharpe Ratio  | 0.40    | 0.79                         |
| Maximum Drawdown (%)  | -55.3   | -17.9                        |
| Up-Month Outperformance (%)                                   | -       | 9.4                          |
| Down-Month Outperformance (%)                                 | -       | 75.0                         |
| <b>RETURN IN PERIODS OF LARGE EQUITY MARKET DRAWDOWNS (%)</b> |         |                              |
| Global Financial Crisis (October 2007 – February 2009)        | -50.2   | 11.7                         |
| Europe/Greece Debt Crisis (April – June 2010)                 | -14.3   | -7.2                         |
| Downgrade of U.S. Debt (August 2011)                          | -16.6   | -2.9                         |
| China's Black Monday (May – September 2015)                   | -7.1    | -9.1                         |
| Inflation Fears (February 2018)                               | -8.5    | 2.5                          |
| Q4 2018 (October – December 2018)                             | -13.5   | -10.5                        |

*It posted double-digit losses in Q4 2018, but slightly outperformed the S&P 500.*

Source: S&P Dow Jones Indices LLC. Data from Dec. 29, 2006, to Dec. 31, 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Table 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.

## 5. CONCLUSION

Passive strategies can take on a much more dynamic role than simply offering broad market exposure. If carefully evaluated on an individual basis, the objectives and performance of the aforementioned indices show the potential to outperform during periods of market volatility.

## PERFORMANCE DISCLOSURE

The S&P 500 Low Volatility Index was launched April 4, 2011. The S&P 500 Quality Index was launched July 8, 2014. The S&P Risk Parity Index – 10% Target Volatility, S&P Risk Parity Index – 12% Target Volatility, and S&P Risk Parity Index – 15% Target Volatility were launched July 9, 2018. The S&P 500 Daily Risk Control 5% Index, S&P 500 Daily Risk Control 10% Index, and S&P 500 Daily Risk Control 15% Index were launched September 10, 2009. The S&P 500 Daily RC2 10% Index and S&P 500 Daily RC2 15% Index were launched May 26, 2011. The S&P 500 Daily RC2 8% Index was launched June 3, 2011. The S&P 500 Managed Risk Index – Conservative, S&P 500 Managed Risk Index – Aggressive, and S&P 500 Managed Risk Index – Moderate were launched April 11, 2016. The S&P 500 Managed Risk 2.0 Index was launched January 23, 2017. The S&P Systematic Global Macro Index was launched August 9, 2011. The S&P 500 Dynamic VEQTOR Index was launched November 18, 2009. 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.spdji.com](http://www.spdji.com). Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown.

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the Index is set at a fixed value for calculation purposes. The Launch Date designates the date upon which the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its datafeed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at [www.spdji.com](http://www.spdji.com) 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.

Another limitation of using back-tested information is that the back-tested calculation is generally prepared with the benefit of hindsight. Back-tested information reflects the application of the index methodology and selection of index constituents in hindsight. No hypothetical record can completely account for the impact of financial risk in actual trading. For example, there are numerous factors related to the equities, fixed income, or commodities markets in general which cannot be, and have not been accounted for in the preparation of the index information set forth, all of which can affect actual performance.

The Index returns shown do not represent the results of actual trading of investable assets/securities. S&P Dow Jones Indices LLC maintains the Index and calculates the Index levels and performance shown or discussed, 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 investment funds that are intended to track the performance of the Index. The imposition of these fees and charges would cause actual and back-tested performance of the securities/fund to be lower than the Index performance shown. As a simple example, if an index returned 10% on a US \$100,000 investment for a 12-month period (or US \$10,000) and an actual asset-based fee of 1.5% was imposed at the end of the period on the investment plus accrued interest (or US \$1,650), the net return would be 8.35% (or US \$8,350) for the year. Over a three year period, an annual 1.5% fee taken at year end with an assumed 10% return per year would result in a cumulative gross return of 33.10%, a total fee of US \$5,375, and a cumulative net return of 27.2% (or US \$27,200).



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