

CONTRIBUTORS

**Alka Banerjee**  
Managing Director  
Product Management  
[alka.banerjee@spglobal.com](mailto:alka.banerjee@spglobal.com)

**Vinit Srivastava**  
Senior Director  
Strategy and Volatility Indices  
[vinit.srivastava@spglobal.com](mailto:vinit.srivastava@spglobal.com)

**Tianyin Cheng**  
Associate Director  
Strategy Indices  
[tianyin.cheng@spglobal.com](mailto:tianyin.cheng@spglobal.com)

In recent years, institutional market participants with long-term investment horizons have responded with aversion to this volatility by considering a number of risk control strategies.

# Limiting Risk Exposure With S&P Risk Control Indices

## INTRODUCTION

The volatility seen during the global financial crisis in 2008 broke the calm that was present in financial markets from 2004 to early 2007. Most asset classes experienced significant pullbacks, the correlation between asset classes increased significantly, and markets became volatile. The [S&P 500](#)<sup>®</sup> lost about 56% of its value between the October 2007 peak and the March 2009 trough. Portfolio construction based on the backward-looking correlation model failed, as the expected diversification benefit was eliminated precisely when it was needed the most.

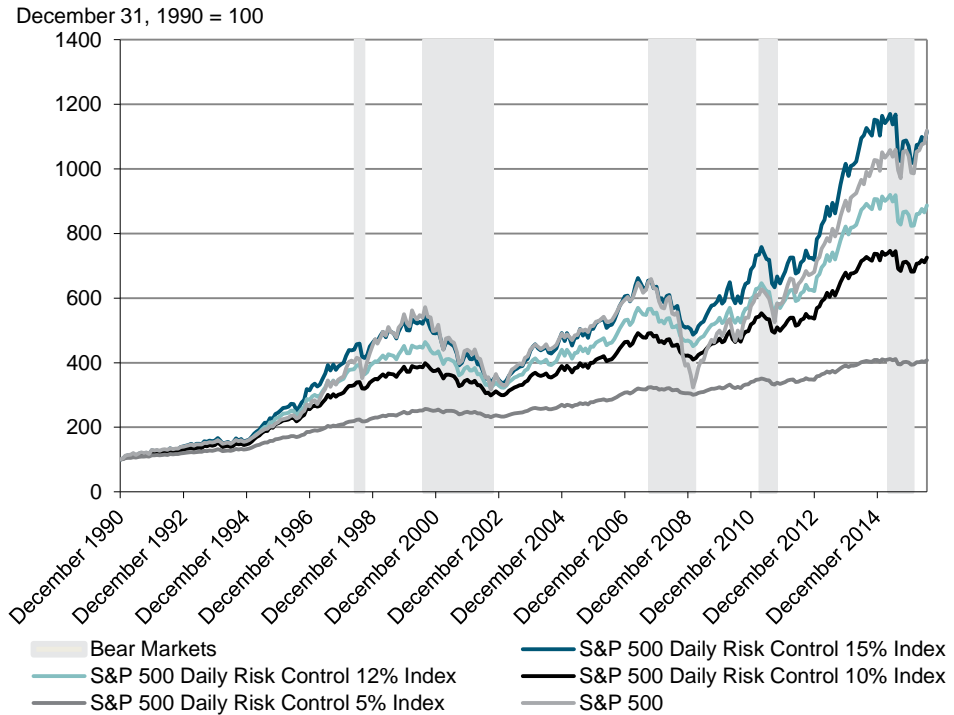
In recent years, institutional market participants with long-term investment horizons have responded with aversion to this volatility by considering a number of risk control strategies. The risk control strategies use dynamic asset allocation (based on an index and cash) to target a stable level of volatility in all market environments by taking advantage of the negative relationship between volatility and return, as well as the persistence of volatility. For institutional market participants with long-standing liabilities, which can range from defined benefit plans to variable annuities offered at insurance companies, a risk control strategy may provide a smoother path of asset returns (see Exhibit 1) and could more closely align the performance of the institution's assets to the characteristics of its liabilities.

S&P Dow Jones Indices has developed a risk control framework through a series of risk control indices, which seek to measure various underlying equity- or futures-based indices at set risk levels. S&P Dow Jones Indices' risk control indices feature:

- Globally accepted, independent underlying indices like the S&P 500 and the [S&P BRIC 40](#);
- Transparent methodology based on the underlying index's historical volatility;
- Measurements of risk, based on volatility, to help market participants control risk at a predefined level; and
- Utilization of the same constituents as the underlying index.

S&P Dow Jones Indices has created a suite of risk control indices based on a large number of equity and thematic indices, along with the [S&P GSCI®](#) and the other commodity indices in its series (see the Appendix for a complete list).

**Exhibit 1: Wealth Curves of the S&P 500 Risk Control Indices**



Risk control indices give market participants the option to choose a desired volatility target level to match their appetite for risk.

Source: S&P Dow Jones Indices LLC. Data as of July 29, 2016. Index levels set to 100 on Dec. 31, 1990. Index performance based on total return in USD. Parameters for the S&P 500 RC Indices: maximum leverage: 150%; interest rate: overnight USD LIBOR; exponentially weighted volatility. 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 about the inherent limitations associated with back-tested performance.

**WHY CONTROL RISK WHEN YOU CAN AVOID IT?**

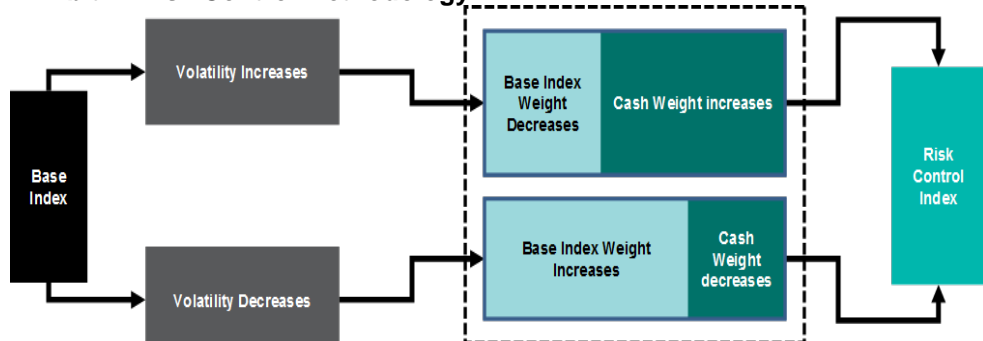
The ability to control risk at certain levels has a couple of advantages. First, it allows market participants to fully invest in the constituents of an index. They are able to gain exposure to the constituents of the underlying index, albeit at a level that is dynamically scaled up or down. This is different from volatility response strategies such as volatility reduction and enhanced beta, which prune the securities from an underlying basket in order to isolate the risk factor. As a result, those strategies tend to have be more concentrated in certain sectors or stocks.

Second, risk control indices give market participants the option to choose a desired volatility target level to match their appetite for risk. For example, a volatility target level of 10% would provide more room for upside potential, while a 5% volatility level would cater to a lower risk appetite.

## HOW RISK CONTROL WORKS

As Exhibit 2 illustrates, risk control indices have two components: the underlying index and a cash component. When volatility increases, the risk control index moves out of the underlying index and into cash. Conversely, if volatility decreases, the risk control index moves more weight into the underlying index and weights less in cash. If the volatility of the underlying index falls below the target levels, the exposure to the index could be leveraged, if desired.

**Exhibit 2: Risk Control Methodology**



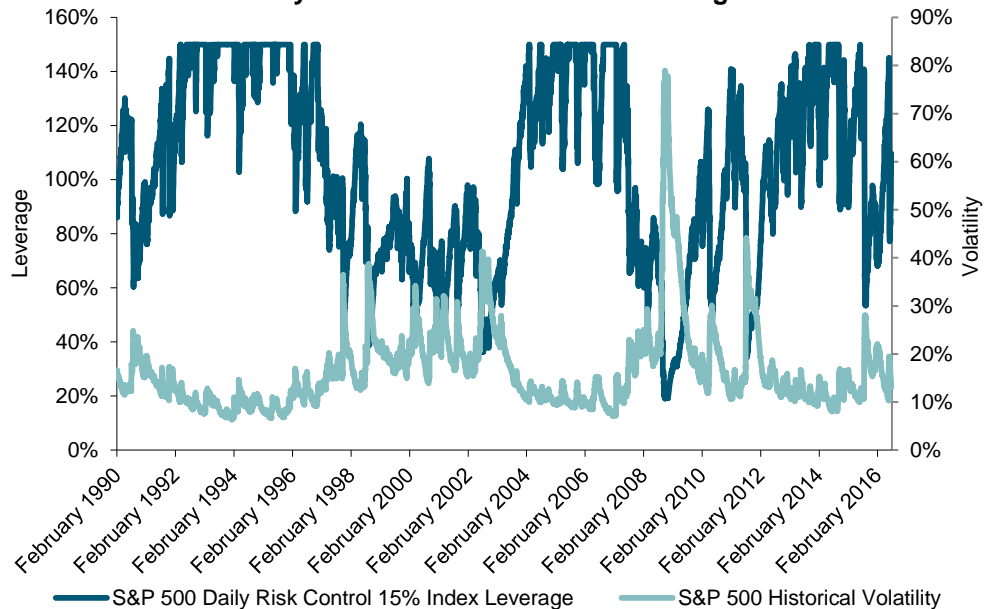
Source: S&P Dow Jones Indices LLC. Chart is provided for illustrative purposes.

Risk control indices have two components: the underlying index and a cash component.

Exhibit 3 illustrates this concept with the [S&P 500 Daily Risk Control 15% Index](#), which (as the name states) has a volatility target of 15%. The exposure to the underlying index is a simple ratio of the target volatility level and the historical volatility, capped by the maximum leverage that is permissible.

For example, the maximum leverage permitted for the S&P 500 Daily Risk Control 15% Index is 150%. Therefore, when the historical volatility level falls to 12%, the index can allocate 125% (15%/12%) into the underlying index by borrowing the rest of the funds.

**Exhibit 2: S&P 500 Daily Risk Control 15% Index–Leverage**



Source: S&P Dow Jones Indices LLC. Data as of July 29, 2016. Parameters for the S&P 500 RC Indices: maximum leverage: 150%, interest rate: overnight USD LIBOR, exponentially weighted volatility. 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 about the inherent limitations associated with back-tested performance.

Risk control total return indices represent the sum of the return of the exposure to the underlying index and the return on the cash component (interest cost or gain).

Risk control total return indices represent the sum of the return of the exposure to the underlying index and the return on the cash component (interest cost or gain). The return of the cash component is a more straightforward function of the short-term rates; if exposure to the index is leveraged, cash needs to be borrowed to pay for the overexposure to the underlying index.

Excess return indices are designed to track return on investments based on indices for which the investments were made through the use of borrowed funds. Thus, the return of an excess return index will be equal to the total return of the risk control index minus the borrowing cost.

**RISK CONTROL PARAMETERS**

Several questions arise about the parameters used in the calculations for risk control indices. These include volatility target, computation of historical volatility, maximum leverage, funding rates for cash returns, and the frequency of index rebalancing. All of these parameters can be customized based on product issuer or market participant requirements.<sup>1</sup>

<sup>1</sup> The parameters used in each of the existing S&P Risk Control Indices are recorded in [“S&P Risk Control Indices Parameters.”](#)

In the case of simple-weighted volatility, the short- and long-term volatility are computed as simple averages over different look-back periods.

### Volatility Target

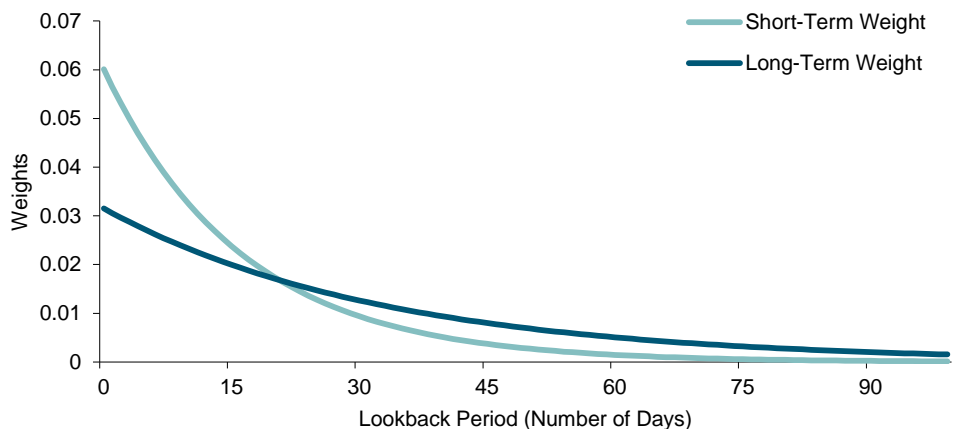
The volatility target is a predefined constant number, set according to the level of risk appetite. There could be a series of risk control indices available using the same underlying index. The volatility target ranges from 5% up to the long-term volatility of the underlying index.

### Historical Volatility

The standard deviation of the underlying index’s natural-log returns is used to measure historical volatility, with two options: simple weighting or exponential weighting. Exponential weighting is the method that is typically preferred. It assigns higher weights to the natural-log returns closer to the rebalancing date when compared with the simple weighted measure. The weights follow an exponential function with a certain decay factor.

Historical volatility, which is used in the computation of index exposures, is the maximum of short- and long-term volatility. With exponential weighting, the distinction between longer- and shorter-term volatility is made by using different decay factors for the exponential functions. A higher rate of decay is used to compute short-term volatility measures, which means days that are closer to the index’s rebalancing have the majority of the impact. A longer decay rate allows days further from the rebalancing to have some impact (see Exhibit 4). In the case of simple-weighted volatility, the short- and long-term volatility are computed as simple averages over different lookback periods.

**Exhibit 3: Weights Attributed to Calculation of Short- and Long-Term Exponentially Weighted Volatility**



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

### Maximum Leverage

Maximum leverage is another important factor for risk control indices. When the historical volatility falls below the volatility target, the risk control index could increase its exposure to the underlying index above 100% if the parameter is set to allow for that. This is achieved by borrowing cash

against the underlying index. The maximum leverage is typically about 150% for most of S&P Dow Jones Indices' risk control indices, but this can be changed.

### **Cash Component**

The return on a risk control index's cash component is computed using interest rates. Indices with daily rebalancing typically use an overnight rate, such as the Euro Overnight Index Average or London Interbank Offered Rate (LIBOR), or a daily valuation of a rolling investment with a three-month interest rate. Some indices use the three-month U.S. Treasury Bill or three-month German Bubill rates. Indices use the relevant rate for the asset class or geographic region of the base index. The same rate is assumed to be used for both lending and borrowing.

### **Rebalancing Frequency**

How often the risk control index's exposure to the underlying index and the cash component is computed is referred to as the index's rebalancing frequency. S&P Dow Jones Indices' risk control indices may employ daily, monthly, or dynamic rebalancing.

Daily rebalancing allows the index to respond to the changes in the market every day the market is open.

Daily rebalancing allows the index to respond to the changes in the market every day the market is open. The index's exposure to the underlying equity index and cash are computed at the end of each trading day using the historical volatility numbers up to and including that day. While this allows the index to respond to daily changes in volatility, it creates more turnover for the index.

Monthly rebalancing only enables the index to update its exposure to the equity and cash components at the end of the last trading day of every calendar month. This reduces index turnover, but it might cause the actual volatility to differ slightly from the target level.

Dynamic rebalancing was recently introduced to address the increased turnover associated with daily rebalancing and the differences in volatility that can come with monthly rebalancing. With dynamic rebalancing, the risk control index's theoretical exposures to the equity index and cash are computed daily, based on historical volatility levels up to that date. However, those weights are not reflected in the risk control index until a certain predefined threshold is breached within the month. If that threshold is not breached, the risk control index would rebalance at the end of the month. This dynamic rebalancing enables risk control indices to respond to large position changes while controlling turnover, which allows them to be used for investable products, such as index funds and ETFs. Indices that currently incorporate dynamic rebalancing include the following.

- S&P 500 Dynamic Rebalancing Risk Control 15% Index
- S&P SmallCap 600 Dynamic Rebalancing Risk Control 18% Index
- S&P Composite 1500 Dynamic Rebalancing Risk Control 15% Index
- [S&P Latin America 40 Dynamic Rebalancing Risk Control 18% Index](#)
- [S&P LTVC Global Dynamic Rebalancing Risk Control 10% Index](#)
- [S&P Global 1200 Climate Change Low Volatility High Dividend Dynamic Rebalancing Risk Control 10% Index](#)

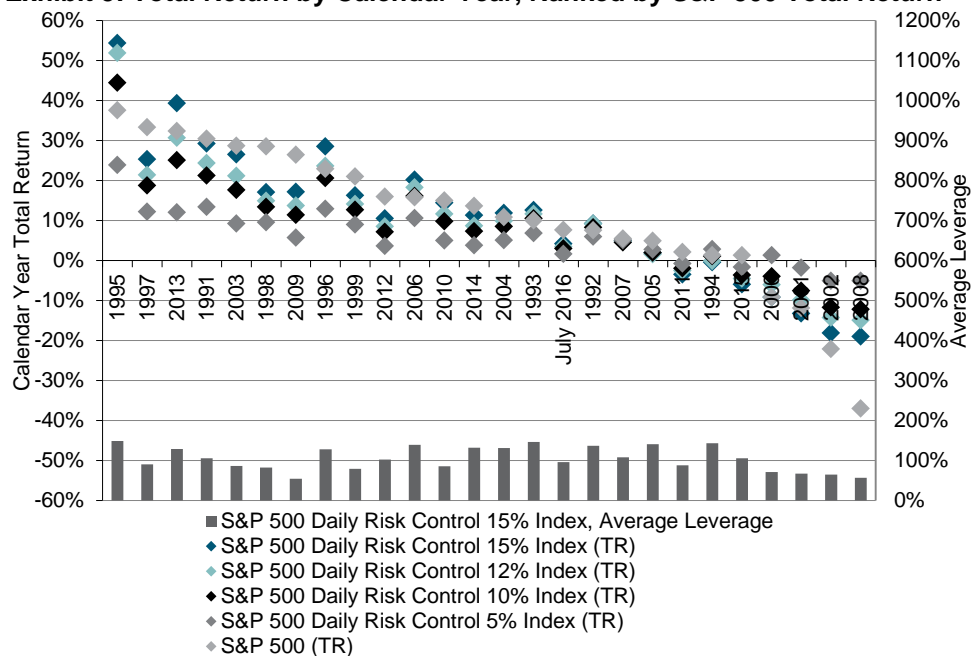
### PERFORMANCE CHARACTERISTICS—S&P 500 RISK CONTROL INDICES

The indices may enhance their performance by using leverage.

The S&P 500 Risk Control Indices, with 5%, 10%, 12%, and 15% as the volatility targets and 150% as the maximum permissible leverage level, typically underperform the [S&P 500](#) during a bull market. This is expected, as the long-term volatility of the S&P 500 is 14.4%. However, the indices may enhance their performance by using leverage (see Exhibit 5). During a bear market, the risk control indices cap the exposure to the underlying index and limit the downside, regardless of the severity of the bear market.

The indices with lower volatility targets produced higher returns during the severe bear markets of 2002 and 2008, which compensated for their comparatively lower returns during the bull markets of 2013 and 2003.

**Exhibit 5: Total Return by Calendar Year, Ranked by S&P 500 Total Return**



Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1990, to July 29, 2016. Index performance based on total return in USD. Parameters for the S&P 500 RC Indices: maximum leverage: 150%, interest rate: overnight USD LIBOR, exponentially weighted volatility. 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 about the inherent limitations associated with back-tested performance.

Exhibits 6 and 7 provide a detailed comparative overview of the S&P 500 Risk Control Indices and the [S&P 500](#) from Dec. 31, 1990, to July 29, 2016. These statistics confirm that risk reduction in these indices is not symmetric, which is evident from the improvement of skewness as well as the Sharpe, Sortino, MAR, and omega ratios.

Drawdowns are intensively reduced in the risk control indices. With the 5% volatility target, the maximum drawdown is cut by 80% and the number of drawdowns greater than 5% only occurred three times over the period studied. It also takes less time to recover to the high watermark for the risk control indices—37 months for the S&P 500 to recover to the pre-financial crisis level, versus 16 months for the [S&P 500 Daily Risk Control 5% Index](#).

Drawdowns are intensively reduced in the risk control indices.

Exhibit 6: Statistical Summary of the S&P 500 and Risk Control Indices					
Statistical Metric	S&P 500 Daily Risk Control Indices				S&P 500
	15%	12%	10%	5%	
Annual Return (%)	9.89	8.91	8.06	5.64	9.90
Maximum Drawdown (%)	-39.22	-31.55	-25.98	-10.37	-50.95
Annual Volatility (%)	12.81	10.53	8.83	4.45	14.38
Annual Skewness	-0.11	-0.10	-0.10	-0.09	-0.18
Monthly Alpha Against the S&P 500	0.14	0.18	0.20	0.22	
T-Stats of Alpha	1.63	2.35	3.00	6.63	
Beta to the S&P 500	0.81	0.66	0.55	0.28	
Correlation With the S&P 500	0.83	0.81	0.81	0.80	
Sharpe Ratio	0.91	0.90	0.90	0.89	
Sortino Ratio	0.57	0.60	0.62	0.69	0.51
MAR Ratio	0.87	0.93	0.96	1.09	0.75
Omega Ratio	0.25	0.28	0.31	0.54	0.19
Annual Turnover (%)	443	434	388	195	
Leverage (%)	105	87	73	37	

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1990, to July 29, 2016. Index performance based on total return in USD. Parameters for the S&P 500 RC Indices: maximum leverage: 150%; interest rate: overnight USD LIBOR; exponentially weighted volatility. 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 about the inherent limitations of back-tested performance.



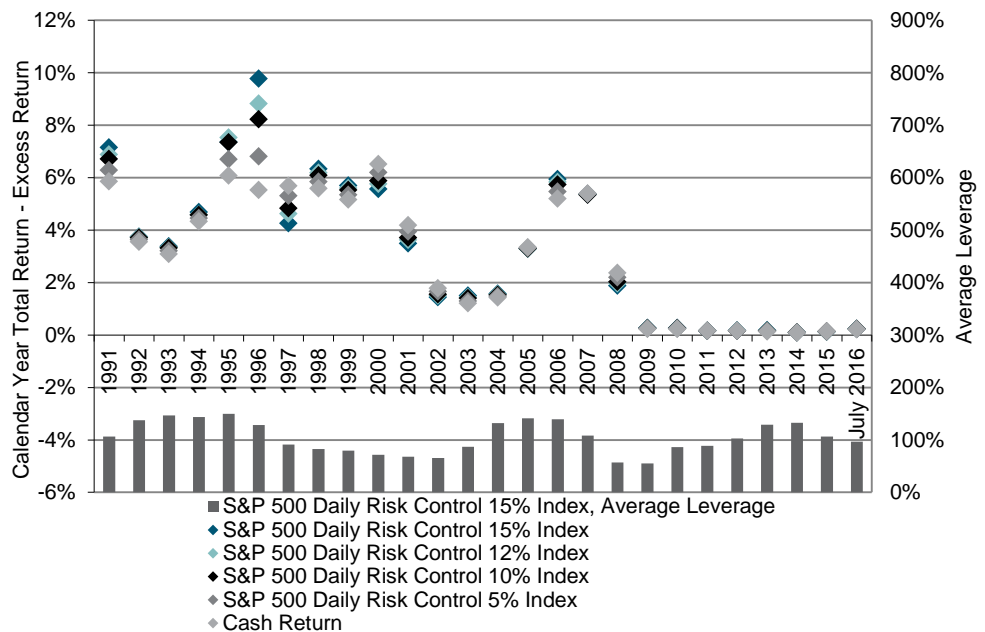
<b>Exhibit 7: Drawdown History</b>					
<b>Drawdown Metric</b>	<b>S&amp;P 500 Daily Risk Control Indices</b>				<b>S&amp;P 500</b>
	<b>15%</b>	<b>12%</b>	<b>10%</b>	<b>5%</b>	
No. of 5% Drawdowns	12	7	6	3	9
Maximum Drawdown	-39.2	-31.5	-26.0	-10.4	-50.9
Peak Date	August 2000	August 2000	August 2000	August 2000	October 2007
Trough Date	September 2002	September 2002	September 2002	September 2002	February 2009
No. of Months From Peak to Trough	25	25	25	25	16
Recovery Length (No. of Months)	48	42	40	16	37
Second Largest Drawdown	-27.2	-21.6	-17.8	-7.7	-44.7
Peak Date	May 2007	October 2007	October 2007	October 2007	August 2000
Trough Date	February 2009	February 2009	February 2009	February 2009	September 2002
No. of Months From Peak to Trough	21	16	16	16	25
Recovery Length (No. of Months)	22	22	20	13	49
Third Largest Drawdown	-17.6	-14.2	-11.9	-6.0	-15.4
Peak Date	April 2011	April 2011	April 2011	April 2011	June 1998
Trough Date	September 2011	September 2011	September 2011	September 2011	August 1998
No. of Months From Peak to Trough	5	5	5	5	2
Recovery Length (No. of Months)	16	16	16	12	3

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1990, to July 29, 2016. Index performance based on total return in USD. Parameters for the S&P 500 RC Indices: maximum leverage: 150%; interest rate: overnight USD LIBOR; exponentially weighted volatility. 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 about the inherent limitations of back-tested performance.

The cash component return is the other part of the risk control index total return, represented by the spread between the total return and excess return.

The cash component return is the other part of the risk control index total return, represented by the spread between the total return and excess return. For the S&P 500 Risk Control Indices illustrated in Exhibit 8, the income from the cash component is historically positive for most years and has come down quite a bit together with the interest rate ever since the financial crisis in 2008.

**Exhibit 8: Spread Between Total Return and Excess Return by Calendar Year**



Source: S&P Dow Jones Indices and/or its affiliates. Data from Dec. 31, 1990, to July 29, 2016. Index performance based on total return in USD. Parameters for the S&P 500 RC Indices: maximum leverage: 150%; interest rate: overnight USD LIBOR; exponentially weighted volatility. 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 about the inherent limitations of back-tested performance.

S&P Dow Jones Indices' Risk Control 2.0 Indices are the next generation of risk control indices, in which the cash portion of the investment in the standard risk control strategy is replaced with a liquid bond index.

## RISK CONTROL 2.0

S&P Dow Jones Indices' Risk Control 2.0 Indices are the next generation of risk control indices, in which the cash portion of the investment in the standard risk control strategy is replaced with a liquid bond index. Unlike the risk control 1.0 indices, in which the cash component is assumed to be risk free and hence have zero volatility, the risk control 2.0 indices assign positive weights to either the underlying index or the bond index so that the target volatility can be achieved. This exercise takes into consideration the volatility of both indices and the correlation between them.

## RISK CONTROL IN THE CONTEXT OF OTHER VOLATILITY STRATEGIES

In recent years, a few other volatility management strategies have come into focus. Prominent among those are low volatility strategies and strategies that allocate between equities and an uncorrelated asset class, like VIX (VEQTOR). Although these strategies tend to be talked about as one group, they are differentiated in their objective, performance in various market cycles, and usage (see Exhibit 9). More information and details can be found in prior S&P Dow Jones Indices research.<sup>2</sup>

<sup>2</sup> [Limiting Risk Without Limiting Equity Exposure](#), S&P Dow Jones Indices, November 2012.

**Exhibit 9: Risk Control Compared to Other Volatility Strategies**

Index Characteristic	Low Volatility	Risk Control	VEQTOR
Approach	Lower volatility	Limit volatility	Allocate away from volatility
Strong bull markets	Lag benchmark—strategies have lower beta than benchmark by design	Lag benchmark—cap on volatility reduces participation in the benchmark as there is no distinction between upside and downside volatility	Lag benchmark—some allocation is always to volatility which will drag down performance
Strong bear markets	Typically outperform	Typically outperform	Typically outperform
Flat (moderately positive/negative or oscillating around a band)	Typically outperform slightly or are even	Typically outperform slightly or are even	Typically underperform—allocation in and out of volatility is costly
Usage	Core holding or combining with core	Capital protection or capital-guaranteed products with some equity participation	Hedge against black swan events

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

Risk control indices provide a means to measure volatility in an underlying index and limit volatility of investments to a tailored level, while still allowing exposure to the index’s returns.

**CONCLUSION**

Risk control indices provide a means to measure volatility in an underlying index and limit volatility of investments to a tailored level, while still allowing exposure to the index’s returns. The data discussed shows that, in the past, these indices have supported necessary protection in bear markets while allowing market participants to take part in some of the upswings. Both academic research and these indices’ historical performance have shown that this performance has been a result of these predefined risk levels, and that a low volatility strategy has been effective in delivering the desired returns.

## APPENDIX

Exhibit 10: S&P Risk Control Indices	
Index Category	Index Family
Dynamic Rebalancing Risk Control Indices	S&P 500 Dynamic Rebalancing Risk Control 15% Index
	S&P SmallCap 600® Dynamic Rebalancing Risk Control 18% Index
	S&P Composite 1500® Dynamic Rebalancing Risk Control 15% Index
	S&P Latin America 40 Dynamic Rebalancing Risk Control 18% Index
	S&P LTVC Global Dynamic Rebalancing Risk Control 10% Index
	S&P Global 1200 Climate Change Low Volatility High Dividend Dynamic Rebalancing Risk Control 10% Index
Developed Market Risk Control Indices	S&P 500® Risk Control Indices
	S&P Europe 350® Risk Control Indices
	S&P/JPX Risk Control Indices
	S&P Asia 50 Risk Control Indices
	S&P/ASX 200 Risk Control Indices
	S&P/TSX 60 Risk Control Indices
	S&P 500 Dividend Aristocrats Risk Control Indices
	S&P 500 Low Volatility Risk Control Indices
	S&P 500 Buyback Risk Control Indices
	S&P 500 Capex Efficiency Risk Control Indices
	S&P Global BMI Risk Control Indices
	S&P Italy LargeMidCap Capped Risk Control Indices
	S&P Nordic LargeCap Risk Control Indices
	Emerging Market Risk Control Indices
S&P BRICT Risk Control Indices	
S&P Latin America 40 Risk Control Indices	
S&P Southeast Asia 40 Risk Control Indices	
S&P Africa 40 Risk Control Indices	
S&P Access Africa Risk Control Indices	
S&P CNX Nifty Futures Risk Control Indices	
S&P Next Emerging 40 Risk Control Indices	
S&P Emerging Asia 40 Risk Control Indices	
S&P BRIC High Yield Risk Control Indices	
Global Thematic Risk Control Indices	S&P Asia Infrastructure Risk Control Indices
	S&P Emerging Markets Infrastructure Indices
	S&P Global Clean Energy Risk Control Indices
	S&P Global Infrastructure Risk Control Indices
	S&P Global Natural Resources Risk Control Indices
	S&P Latin America Infrastructure Risk Control Indices
Commodities Risk Control Indices	Dow Jones U.S. Real Estate Risk Control Indices
	S&P GSCI Risk Control Indices
	S&P GSCI Dynamic Roll Risk Control Indices

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

Exhibit 11: S&P Risk Control Indices Performance								
Ann. (%)	Past 15 Years		Past 10 Years		Past 5 Years		Past 3 Years	
	Return	Volatility	Return	Volatility	Return	Volatility	Return	Volatility
S&P 500	6.08	14.71	7.75	15.27	13.38	12.08	11.16	11.11
S&P 500 Daily Risk Control 15% Index	6.19	12.04	8.01	12.20	9.35	12.83	7.61	13.03
S&P 500 Daily Risk Control 12% Index	5.37	9.70	6.76	9.83	7.57	10.31	6.15	10.51
S&P 500 Daily Risk Control 10% Index	4.80	8.08	5.87	8.19	6.41	8.59	5.24	8.75
S&P 500 Daily Risk Control 5% Index	3.29	4.03	3.60	4.10	3.38	4.29	2.81	4.37
S&P 500 Daily RC2 15% Index	7.36	11.01	9.29	11.41	11.09	10.78	9.70	10.30
S&P 500 Daily RC2 10% Index	6.54	8.44	7.79	8.86	8.26	8.33	6.90	8.60
S&P 500 Daily RC2 8% Index	6.69	6.45	7.59	6.62	7.45	6.70	6.45	7.03
S&P 500 Dividend Aristocrats	10.04	12.99	10.99	14.09	16.77	10.40	13.27	10.58
S&P 500 Dividend Aristocrats Daily Risk Control 15% Index	10.57	11.76	11.65	11.93	14.69	12.31	11.39	13.01
S&P 500 Dividend Aristocrats Daily Risk Control 12% Index	8.86	9.53	9.71	9.64	11.73	9.97	8.98	10.59
S&P 500 Dividend Aristocrats Daily Risk Control 10% Index	7.76	7.94	8.40	8.04	9.84	8.33	7.53	8.87
S&P 500 Dividend Aristocrats Daily Risk Control 5% Index	4.96	3.94	5.13	4.00	5.23	4.16	4.08	4.43
S&P 500 Low Volatility Index	9.38	10.38	9.85	11.17	15.32	9.33	12.79	9.90
S&P 500 Low Volatility Daily Risk Control 15% Index	11.60	11.97	12.41	12.45	16.26	13.11	14.20	13.49
S&P 500 Low Volatility Daily Risk Control 12% Index	10.22	10.02	10.64	10.38	13.21	11.07	11.06	11.34
S&P 500 Low Volatility Daily Risk Control 10% Index	8.93	8.41	9.23	8.74	10.95	9.36	9.08	9.67
S&P 500 Low Volatility Daily Risk Control 5% Index	5.52	4.17	5.52	4.34	5.76	4.67	4.82	4.84
S&P BRIC 40	-	-	4.44	26.46	-3.16	22.18	0.20	19.80
S&P BRIC 40 Daily Risk Control 18% Index	-	-	2.00	18.21	-6.32	19.17	-1.51	18.87
S&P BRIC 40 Daily Risk Control 15% Index	-	-	2.18	15.20	-4.97	16.01	-0.90	15.75
S&P BRIC 40 Daily Risk Control 10% Index	-	-	2.24	10.17	-2.95	10.71	-0.22	10.51
S&P BRIC 40 Daily Risk Control 5% Index	-	-	2.08	5.13	-1.11	5.37	0.24	5.26
S&P BRIC 40 Daily RC2 15% Index	-	-	4.26	15.56	-4.08	15.85	0.00	15.37
S&P BRIC 40 Daily RC2 10% Index	-	-	3.68	10.36	-1.90	10.84	1.64	10.38
S&P BRIC 40 Daily RC2 8% Index	-	-	3.71	8.43	-1.05	8.69	2.05	8.25

Source: S&P Dow Jones Indices LLC. Data as of July 29, 2016. 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 about the inherent limitations associated with back-tested performance.

## PERFORMANCE DISCLOSURE

The S&P 500 Daily Risk Control 5% Index, S&P 500 Daily Risk Control 15% Index, and the S&P 500 Monthly Risk Control 12% Index were launched on Sept. 9, 2010. The S&P 500 Daily Risk Control 10% Index was launched on May 13, 2009. The S&P 500 Daily Risk Control 12% Index was launched on April 21, 2010. The S&P 500 Dynamic Rebalancing Risk Control 15% Index was launched on Jan. 3, 2012. The S&P BRIC 40 Risk Control 18% Index was launched on Nov. 17, 2008. The S&P BRIC 40 Daily Risk Control Indices (5%, 10% and 15%) were launched on Sept. 16, 2009. The S&P BRIC 40 was launched on June 20, 2006. 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. Complete index methodology details are available at [www.spdji.com](http://www.spdji.com).

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.

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. 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).

## GENERAL DISCLAIMER

© 2016 S&P Dow Jones Indices LLC, a division of S&P Global. All rights reserved. S&P, SPDR and S&P 500 are registered trademarks of Standard & Poor's Financial Services LLC, a division of S&P Global ("S&P"). DOW JONES is a registered trademark of Dow Jones Trademark Holdings LLC ("Dow Jones"). These trademarks together with others have been licensed to S&P Dow Jones Indices LLC. Redistribution, reproduction and/or photocopying in whole or in part are prohibited without written permission. This document does not constitute an offer of services in jurisdictions where S&P Dow Jones Indices LLC, Dow Jones, S&P or their respective affiliates (collectively "S&P Dow Jones Indices") do not have the necessary licenses. All information provided by S&P Dow Jones Indices is impersonal and not tailored to the needs of any person, entity or group of persons. S&P Dow Jones Indices receives compensation in connection with licensing its indices to third parties. Past performance of an index is not a guarantee of future results.

It is not possible to invest directly in an index. Exposure to an asset class represented by an index is available through investable instruments based on that index. S&P Dow Jones Indices does not sponsor, endorse, sell, promote or manage any investment fund or other investment vehicle that is offered by third parties and that seeks to provide an investment return based on the performance of any index. S&P Dow Jones Indices makes no assurance that investment products based on the index will accurately track index performance or provide positive investment returns. S&P Dow Jones Indices LLC is not an investment advisor, and S&P Dow Jones Indices makes no representation regarding the advisability of investing in any such investment fund or other investment vehicle. A decision to invest in any such investment fund or other investment vehicle should not be made in reliance on any of the statements set forth in this document. Prospective investors are advised to make an investment in any such fund or other vehicle only after carefully considering the risks associated with investing in such funds, as detailed in an offering memorandum or similar document that is prepared by or on behalf of the issuer of the investment fund or other investment product or vehicle. S&P Dow Jones Indices LLC is not a tax advisor. A tax advisor should be consulted to evaluate the impact of any tax-exempt securities on portfolios and the tax consequences of making any particular investment decision. Inclusion of a security within an index is not a recommendation by S&P Dow Jones Indices to buy, sell, or hold such security, nor is it considered to be investment advice. Closing prices for S&P Dow Jones Indices' US benchmark indices are calculated by S&P Dow Jones Indices based on the closing price of the individual constituents of the index as set by their primary exchange. Closing prices are received by S&P Dow Jones Indices from one of its third party vendors and verified by comparing them with prices from an alternative vendor. The vendors receive the closing price from the primary exchanges. Real-time intraday prices are calculated similarly without a second verification.

These materials have been prepared solely for informational purposes based upon information generally available to the public and from sources believed to be reliable. No content contained in these materials (including index data, ratings, credit-related analyses and data, research, valuations, model, software or other application or output therefrom) or any part thereof ("Content") may be modified, reverse-engineered, reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of S&P Dow Jones Indices. The Content shall not be used for any unlawful or unauthorized purposes. S&P Dow Jones Indices and its third-party data providers and licensors (collectively "S&P Dow Jones Indices Parties") do not guarantee the accuracy, completeness, timeliness or availability of the Content. S&P Dow Jones Indices Parties are not responsible for any errors or omissions, regardless of the cause, for the results obtained from the use of the Content. THE CONTENT IS PROVIDED ON AN "AS IS" BASIS. S&P DOW JONES INDICES PARTIES DISCLAIM ANY AND ALL EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, FREEDOM FROM ERRORS OR DEFECTS. In no event shall S&P Dow Jones Indices Parties be liable to any party for any direct, indirect, incidental, exemplary, compensatory, punitive, special or consequential damages, costs, expenses, legal fees, or losses (including, without limitation, lost income or lost profits and opportunity costs) in connection with any use of the Content even if advised of the possibility of such damages.

Credit-related information and other analyses, including ratings, research and valuations are generally provided by licensors and/or affiliates of S&P Dow Jones Indices, including but not limited to S&P Global's other divisions such as Standard & Poor's Financial Services LLC and S&P Capital IQ LLC. Any credit-related information and other related analyses and statements in the Content are statements of opinion as of the date they are expressed and not statements of fact. Any opinion, analyses and rating acknowledgement decisions are not recommendations to purchase, hold, or sell any securities or to make any investment decisions, and do not address the suitability of any security. S&P Dow Jones Indices does not assume any obligation to update the Content following publication in any form or format. The Content 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. S&P Dow Jones Indices LLC does not act as a fiduciary or an investment advisor. While S&P Dow Jones Indices has obtained information from sources they believe to be reliable, S&P Dow Jones Indices does not perform an audit or undertake any duty of due diligence or independent verification of any information it receives.

To the extent that regulatory authorities allow a rating agency to acknowledge in one jurisdiction a rating issued in another jurisdiction for certain regulatory purposes, S&P Global Ratings Services reserves the right to assign, withdraw or suspend such acknowledgement at any time and in its sole discretion. S&P Dow Jones Indices, including S&P Global Ratings Services, disclaim any duty whatsoever arising out of the assignment, withdrawal or suspension of an acknowledgement as well as any liability for any damage alleged to have been suffered on account thereof.

Affiliates of S&P Dow Jones Indices LLC, including S&P Global Ratings Services, may receive compensation for its ratings and certain credit-related analyses, normally from issuers or underwriters of securities or from obligors. Such affiliates of S&P Dow Jones Indices LLC, including S&P Global Ratings Services, reserve the right to disseminate its opinions and analyses. Public ratings and analyses from S&P Global Ratings Services are made available on its Web sites, [www.standardandpoors.com](http://www.standardandpoors.com) (free of charge), and [www.ratingsdirect.com](http://www.ratingsdirect.com) and [www.globalcreditportal.com](http://www.globalcreditportal.com) (subscription), and may be distributed through other means, including via S&P Global Rating Services publications and third-party redistributors. Additional information about our ratings fees is available at [www.standardandpoors.com/usratingsfees](http://www.standardandpoors.com/usratingsfees).

S&P Global keeps certain activities of its various divisions and business units separate from each other in order to preserve the independence and objectivity of their respective activities. As a result, certain divisions and business units of S&P Global may have information that is not available to other business units. S&P Global has established policies and procedures to maintain the confidentiality of certain non-public information received in connection with each analytical process.