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The Sum of the Parts

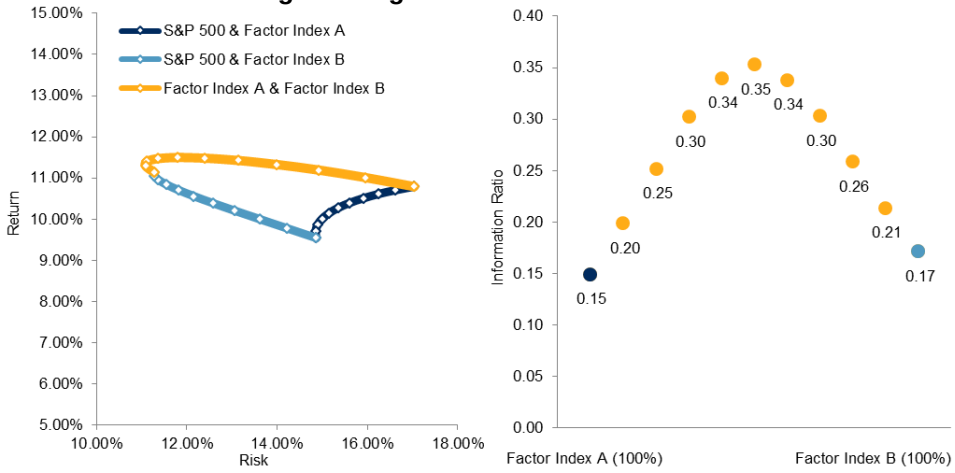
"All animals are equal, but some animals are more equal than others"

- *Animal Farm*, George Orwell.

EXECUTIVE SUMMARY

- Factor-based indexing—or "smart" beta—has gained popularity as an efficient way to access strategies that were formerly the exclusive preserve of active managers. If single-factor indices work well, it may be that two factors are better than one.
- Not every combination of two factors is advantageous; the risk/return profile of the individual factors and the correlation between them are factors to consider when considering factor combinations.
- Even when the risk/return profiles of factor indices are similar, factor combinations can lower tracking error and raise information ratios.
- Combining factors by bolting single-factor indices together is by no means the only way to exploit multiple factors. An advantage of this combination technique is its simplicity; a drawback is that it most likely does not provide optimal factor exposure as compared with a multi-factor approach at the stock level.[1]

Exhibit 1: The right combination of factor indices can offer diversification benefits while lowering tracking error.



Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. Past performance is no guarantee of future results. Charts are provided for illustrative purposes and reflect hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

[1] Innes, Andrew, "The Merits and Methods of Multi-Factor Investing," April 2017.

INTRODUCTION

Index-based investing has enjoyed significant growth in the past 20 years, and has evolved from simply benchmarking and replicating the broad market to indexing factors. We use the term "factor" to denote a quality or attribute with which excess returns (or at least excess risk-adjusted returns) are thought to be associated. Defensive factors such as low volatility gained particular prominence in the aftermath of the 2008 financial crisis. In the time since, other factors have also attracted attention, and factor-based investing has proliferated in terms of both the number of products based on factor indices and in assets tied to those vehicles globally.[2]

One convenient way to classify factor indices is to consider their level of relative volatility.

Given the success of strategies that exploit single factors, it is not surprising that strategies designed to exploit more than one factor have begun to pique the interest of market participants. If two factors work independently, they might also work well in combination. This paper will explore a framework in which factors can be analyzed for their potential contribution as a piece of the whole.

EVALUATING FACTOR FEATURES

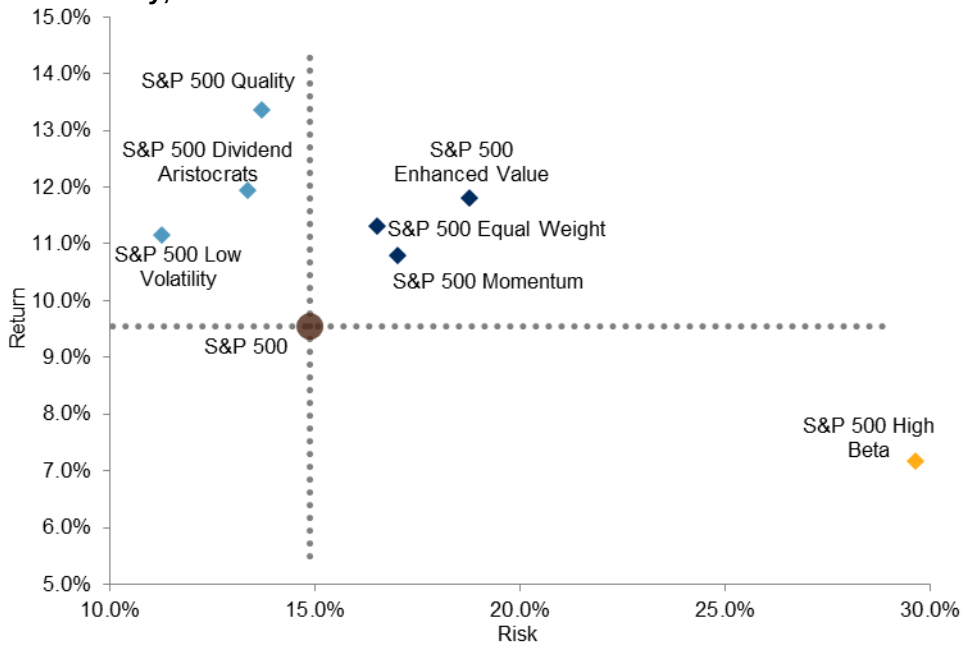
There are many ways to classify factor indices. One convenient way is to consider their level of relative volatility; compared with the benchmark index of which it is a subset, does a factor index *mitigate* or *magnify* risk? In Exhibit 2, we map the risk/return profiles of several factor indices between 1995 and 2016.[3] During this period, the S&P 500® posted a compound annual return of 9.6% with a standard deviation of 14.9%. With the exception of the S&P 500 High Beta Index,[4] every other factor index outperformed the S&P 500. Those plotted to the left of the vertical dotted line exhibited lower risk (i.e. were risk mitigators), while those to the right magnified the market's risk.

[2] A Global Guide to Strategic-Beta Exchange-Traded Products, Morningstar, September 2016.

[3] Each of the indices in Exhibit 2 is a subset of the S&P 500. See also Chan, Fei Mei and Craig J. Lazzara, "Gauging Differential Returns," January 2014.

[4] The index is designed to measure the performance of 100 constituents in the S&P 500 that are most sensitive to changes in market returns. For more details, see the complete methodology.

Exhibit 2: Most factor indices have outperformed the S&P 500; some, anomalously, with lower risk.



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Even the best-performing factor index will sometimes underperform its cap-weighted parent.

STRATEGY ALLOCATION: CONCEPTUALIZING FACTOR PAIRS

There is no magic bullet that will tell a market participant which factor indices are optimal, or even appropriate, and there is certainly no solution that is appropriate for all investors.

- If past performance were an accurate predictor of future results, then a mean-variance-sensitive market participant would *always* prefer a risk mitigator to a risk magnifier. The mitigators, as a group, have higher returns and lower volatility than the magnifiers. Why take more risk if you are not paid to do so?
- One reason might be to ameliorate periods of underperformance. Even the best-performing factor index will sometimes underperform its cap-weighted parent. Combining two factor indices might limit the extent and duration of underperformance.
- To the degree that periods of underperformance offset, two factor indices in combination might produce less tracking error than either factor index separately. This in turn could improve an investor's information ratio.[5]

[5] The information ratio is the ratio of excess return to tracking error; it tells us how many units of return an investor receives for every unit of tracking error he accepts. The Sharpe ratio is analogous, but the divisor there is total volatility; the Sharpe ratio tells us how many units of return an investor receives for every unit of total volatility he accepts.

- Smart beta starts small; an investor may invest in a single factor, while the majority of his assets remain in a cap-weighted index. However, two factors in combination may provide superior outcomes relative to one factor combined with a cap-weighted core.

Not unlike typical asset allocation considerations, risk, return, and correlation all come into play when conceptualizing factor combinations. Logically, it makes sense to pair factors that have outperformed over time, but to pair two risk mitigators (or two risk magnifiers) would probably offer a relatively small diversification benefit. We can find some evidence for this by calculating the correlations of the factor return spreads over time (see Exhibit 3). Consider the S&P 500 Quality Index,[6] one of Exhibit 2's risk mitigators. The index has relatively high correlations with its fellow mitigators (the S&P 500 Low Volatility Index[7] and S&P 500 Dividend Aristocrats Index,[8] at 0.465 and 0.407, respectively), and neutral to negative correlations with the risk magnifiers (the S&P 500 Enhanced Value Index, S&P 500 Momentum Index,[9] and S&P 500 Equal Weight Index).[10]

Not unlike typical asset allocation considerations, risk, return, and correlation all come into play when conceptualizing factor combinations.

Exhibit 3: The correlations of factor indices' excess returns exhibit high variation.

INDEX	S&P 500 EQUAL WEIGHT	S&P 500 LOW VOLATILITY	S&P 500 DIVIDEND ARISTOCRATS	S&P 500 MOMENTUM	S&P 500 QUALITY	S&P 500 ENHANCED VALUE
S&P 500 LOW VOLATILITY	0.223	-	-	-	-	-
S&P 500 DIVIDEND ARISTOCRATS	0.392	0.762	-	-	-	-
S&P 500 MOMENTUM	-0.468	-0.239	-0.436	-	-	-
S&P 500 QUALITY	-0.003	0.465	0.407	-0.147	-	-
S&P 500 ENHANCED VALUE	0.729	0.184	0.374	-0.470	-0.026	-
S&P 500 HIGH BETA	0.332	-0.697	-0.522	-0.111	-0.444	0.199

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. 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.

To illustrate pairing a mitigator and a magnifier, consider the example provided by the S&P 500 Low Volatility Index and S&P 500 Momentum

[6] The index is designed to track high quality stocks in the S&P 500 by quality score, which is calculated based on return on equity, accruals ratio, and financial leverage ratio. For more details, see the complete methodology.

[7] The index is designed to measure the performance of the 100 least volatile stocks in the S&P 500. For more details, see the complete methodology.

[8] The index is designed to measure the performance S&P 500 companies that have increased dividends every year for the last 25 consecutive years. For more details, see the complete methodology.

[9] The index is designed to measure the performance of securities in the S&P 500 universe that exhibit persistence in their relative performance. For more details, see the complete methodology.

[10] The index includes the same constituents as the market cap-weighted S&P 500, but each company in the S&P 500 Equal Weight is allocated a fixed weight. For more details, see the complete methodology.

Index. The correlation between their return spreads was -0.239. Both outperformed the S&P 500 in the observed time period, with compound annual growth rates of 11.1% and 10.8%, respectively.

The low volatility strategy is, not surprisingly, defensive in nature. It tends to lag the S&P 500 in good environments but outperform it during bad times. Exhibit 4 provides a snapshot of the relative performance profiles of the S&P 500 Low Volatility Index and the S&P 500 Momentum Index.

The low volatility strategy tends to lag the S&P 500 in good environments but outperform it during bad times.

Exhibit 4: The S&P 500 Low Volatility Index tends to outperform falling markets and underperform in rising markets, while the performance of the S&P 500 Momentum Index doesn't have a clear relationship to the direction of the market as a whole.

ENVIRONMENT[11]	COUNT OF MONTHS	RETURN (%)				
		S&P 500	S&P 500 LOW VOLATILITY	S&P 500 MOMENTUM	S&P 500 LOW VOLATILITY MINUS S&P 500	S&P 500 MOMENTUM MINUS S&P 500
Declines larger than -2.55%	46	-6.04	-2.89	-6.18	3.15	-0.14
Declines between -2.55% and 0%	46	-1.41	-0.47	-1.20	0.93	0.20
Gains between 0% and 2.72%	86	1.35	1.23	1.64	-0.12	0.29
Gains larger than 2.72%	86	5.21	3.36	5.19	-1.86	-0.03

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. 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.

Although both Low Volatility and Momentum outperformed during the period studied, they outperformed in different ways and at different times. Exhibit 4 illustrates the defensive character of the S&P 500 Low Volatility Index, which tends to outperform falling markets and underperform in rising markets.[12] In contrast, the S&P 500 Momentum Index achieved its outperformance with significantly higher risk, and without a clear relationship to the direction of the market as a whole.

This insight gives rise to Exhibit 5, which shows efficient frontiers utilizing various combinations of the S&P 500, S&P 500 Low Volatility Index, and S&P 500 Momentum Index. The light blue line is an efficient frontier built from combinations of the S&P 500 Low Volatility Index and the S&P 500; the dark blue line shows combinations of the S&P 500 Momentum Index and the S&P 500; and the gold line is the efficient frontier built from the two factor indices.

[11] In Exhibit 4, we first separated our database into positive and negative months (depending on the performance of the S&P 500), and then divided each set of months in half.

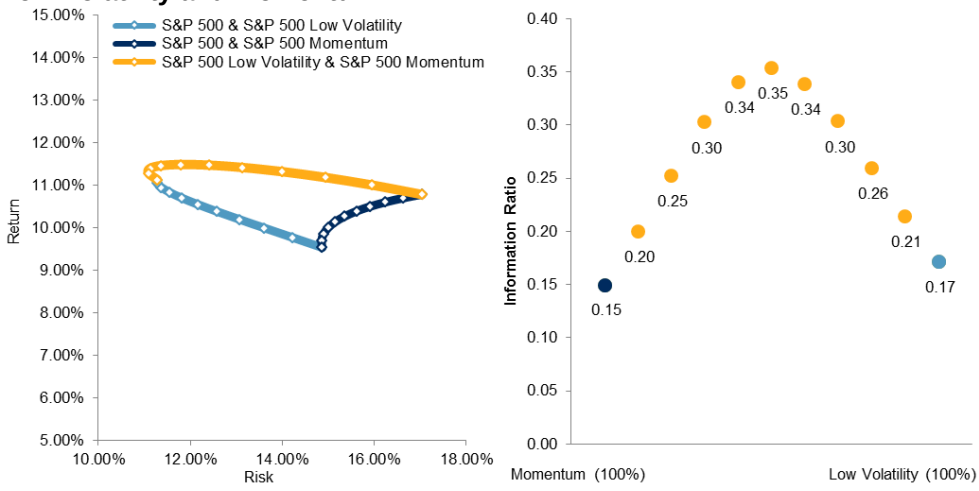
[12] Low Volatility (and other defensive) strategies are often described as offering *protection* in down markets and *participation* in up markets (with the obvious and alliterative caution that neither the protection nor the participation are *perfect*).

We can draw three conclusions from Exhibit 5.

- For a market participant interested only in factor indices, the S&P 500 Low Volatility Index would have been preferred over the S&P 500 Momentum Index. The S&P 500 Low Volatility Index's return is modestly higher than that of the S&P 500 Momentum Index, and its risk level is dramatically lower. Hence, the risk/return tradeoff favors the S&P 500 Low Volatility Index.
- In isolation, both the S&P 500 Low Volatility and S&P 500 Momentum Indices have relatively high levels of tracking error (10.04% and 8.32%, respectively). Combinations of the two reduce tracking error and therefore increase information ratios dramatically.
- **Any allocation between the S&P 500 Low Volatility Index and S&P 500 Momentum Index dominates a combination of either index with the S&P 500.**

Exhibit 5: Efficient frontiers: Allocation between the S&P 500 Low Volatility Index and S&P 500 Momentum Index dominates a combination of either index with the S&P 500. Information ratio peaks at the 50/50 combination of Low Volatility and Momentum.

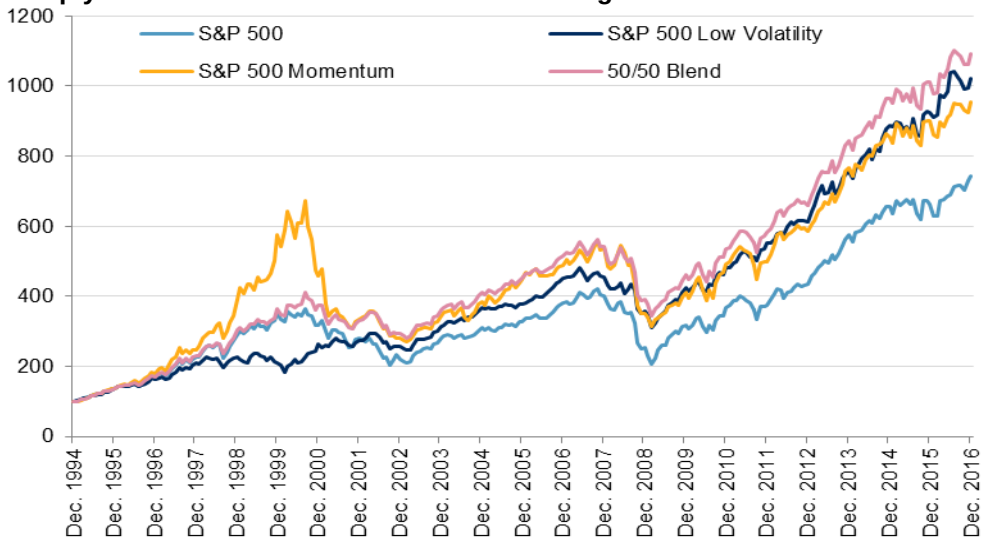
A 50/50 blend of the two factor indices did not suffer from the underperformance that the S&P 500 Low Volatility Index encountered during the inflation of the technology bubble in the late 1990s.



Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. Past performance is no guarantee of future results. Charts are provided for illustrative purposes and reflect 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.

Exhibit 6 shows the performance history of a portfolio allocated equally between the S&P 500 Low Volatility Index and S&P 500 Momentum Index. The 50/50 blend did not suffer from the underperformance that the S&P 500 Low Volatility Index encountered during the inflation of the technology bubble in the late 1990s. Additionally, during the 2008 financial crisis, the 50/50 blend did not drop as sharply as the S&P 500 Momentum Index.

Exhibit 6: A 50/50 blend of the two factor indices did not suffer from the underperformance that the S&P 500 Low Volatility Index encountered during the inflation of the technology bubble in the late 1990s nor did it drop as sharply as the S&P 500 Momentum Index during the financial crisis of 2008.



Source: S&P Dow Jones Indices LLC. Data from Sep. 30, 1994, through Dec. 31, 2016. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

The blended portfolio outperformed the S&P 500 in all but the strongest market environments.

In Exhibit 7 we see that the blended portfolio outperformed the S&P 500 in all but the strongest market environments, when it lagged by 0.90% monthly.

Exhibit 7: Performance differential of 50/50 blend (S&P 500 Low Volatility Index and S&P 500 Momentum Index) in various market environments.

ENVIRONMENT	COUNT OF MONTHS	RETURN (%)			
		S&P 500	S&P 500 LOW VOLATILITY	S&P 500 MOMENTUM	50% S&P 500 LOW VOLATILITY/50% S&P 500 MOMENTUM
Declines larger than -2.55%	46	-6.04	3.15	-0.14	1.54
Declines between -2.55% and 0%	46	-1.41	0.93	0.20	0.59
Gains between 0% and 2.72%	86	1.35	-0.12	0.29	0.12
Gains larger than 2.72%	86	5.21	-1.86	-0.03	-0.90

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. 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.

We can observe the benefit of the low correlation of the S&P 500 Low Volatility Index and S&P 500 Momentum Index in Exhibit 8; the compound annual return of the combination of the two (11.48%) was higher than the compound annual return of either index separately (11.14% and 10.79%, respectively). Moreover, the tracking error of the combination (5.48%) was substantially lower than that of either of the components (10.04% and 8.32%).

Exhibit 8: A 50/50 blend of the S&P 500 Low Volatility Index and the S&P 500 Momentum Index outperformed either index alone, with lower tracking error.

METRIC	S&P 500	S&P 500 LOW VOLATILITY	S&P 500 MOMENTUM	50% S&P 500 LOW VOLATILITY/50% S&P 500 MOMENTUM
CAGR (%)	9.43	11.02	10.79	11.48
Mean (%)	10.16	11.13	11.76	11.69
Standard Deviation (%)	14.82	11.26	17.03	12.40
Mean/SD	0.686	0.989	0.691	0.943
Beta	1.00	0.56	0.97	0.77
R-squared	1.00	0.54	0.72	0.85
Tracking Error (%)	-	10.04	8.32	5.48

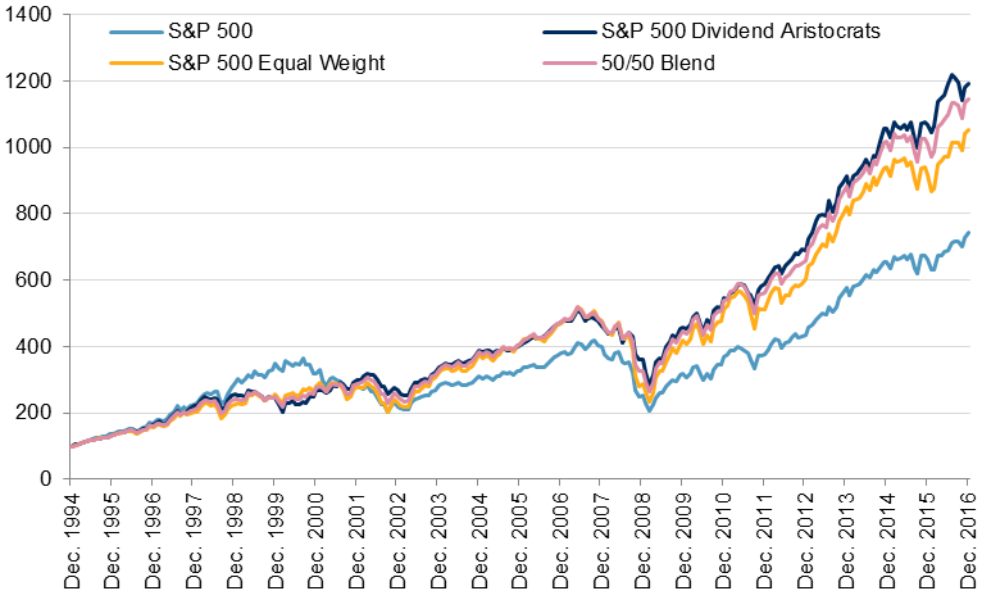
Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

DIVIDEND ARISTOCRATS AND EQUAL WEIGHT

The S&P 500 Dividend Aristocrats Index exhibits a defensive pattern of returns, while the S&P 500 Equal Weight Index is relatively indifferent to the direction of the overall market.

The S&P 500 Dividend Aristocrats Index and S&P 500 Equal Weight Index give us another illustration of combining a risk mitigator and a risk magnifier. The correlation between the two indices' return spreads was 0.39 from 1995 to 2016. Both outperformed the S&P 500 (see Exhibit 9) with compound annual returns of 11.9% and 11.3%, respectively, compared with 9.6% for the S&P 500.

Exhibit 9: The S&P 500 Dividend Aristocrats Index and the S&P 500 Equal Weight Index both outperformed the S&P 500.



Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

As with the S&P 500 Low Volatility Index and S&P 500 Momentum, the S&P 500 Dividend Aristocrats and S&P 500 Equal Weight Index outperformed the S&P 500 in different ways.

As with the S&P 500 Low Volatility Index and S&P 500 Momentum Index, the S&P 500 Dividend Aristocrats Index and S&P 500 Equal Weight Index outperformed the S&P 500 in different ways. Exhibit 10 shows the defensive nature of the S&P 500 Dividend Aristocrats Index, while the S&P 500 Equal Weight Index is relatively indifferent to the direction of the overall market.

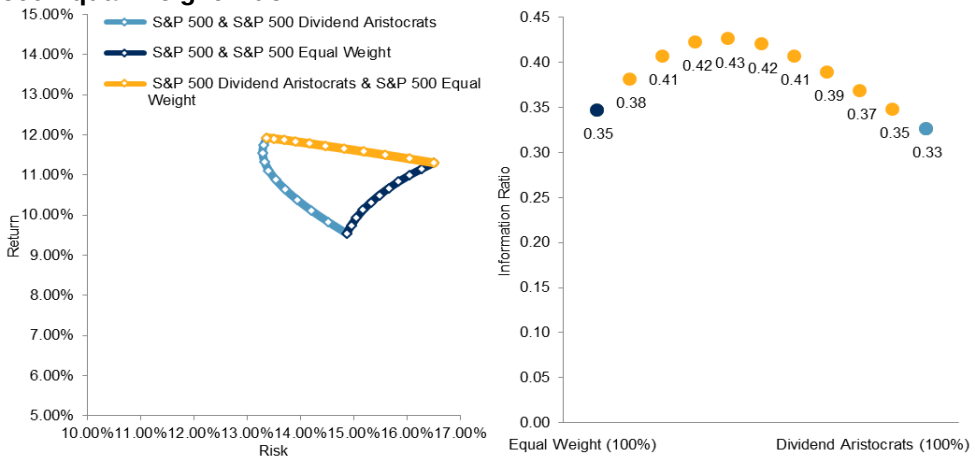
Exhibit 10: Performance of the S&P 500 Dividend Aristocrats Index and S&P 500 Equal Weight Index in various market environments.

ENVIRONMENT	COUNT OF MONTHS	RETURN (%)				
		S&P 500	S&P 500 DIVIDEND ARISTOCRATS	S&P 500 EQUAL WEIGHT	S&P 500 DIVIDEND ARISTOCRATS MINUS S&P 500	S&P 500 EQUAL WEIGHT MINUS S&P 500
Declines larger than -2.55%	46	-6.04	-4.17	-6.07	1.87	-0.03
Declines between -2.55% and 0%	46	-1.41	-0.64	-1.51	0.76	-0.10
Gains between 0% and 2.72%	86	1.35	1.29	1.55	-0.06	0.20
Gains larger than 2.72%	86	5.21	4.32	5.52	-0.90	0.30

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. 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.

Exhibit 11 shows the three efficient frontiers created from combinations of the S&P 500, S&P 500 Dividend Aristocrats Index, and S&P 500 Equal Weight Index. The frontiers form a shape similar to the ones created with the S&P 500 Low Volatility Index and S&P 500 Momentum Index. Any combination of factor indices produced a higher return than an equally risky combination of a single factor with the S&P 500.

Exhibit 11: Efficient frontiers – S&P 500 Dividend Aristocrats Index and S&P 500 Equal Weight Index



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A 50/50 allocation between the two factor indices outperformed in all but the best months of the S&P 500.

A 50/50 allocation between the two factor indices outperformed in all but the best months of the S&P 500 (sees Exhibits 12 and 13).

Exhibit 12: A 50/50 combination of S&P 500 Dividend Aristocrats Index and S&P 500 Equal Weight Index improved performance in all but the best performing market environments.

ENVIRONMENT	COUNT OF MONTHS	RETURN (%)			
		S&P 500	S&P 500 DIVIDEND ARISTOCRATS MINUS S&P 500	S&P 500 EQUAL WEIGHT MINUS S&P 500	50% S&P 500 DIVIDEND ARISTOCRATS/50% S&P 500 EQUAL WEIGHT
Declines larger than -2.55%	46	-6.04	1.87	-0.03	0.95
Declines between -2.55% and 0%	46	-1.41	0.76	-0.10	0.33
Gains between 0% and 2.72%	86	1.35	-0.06	0.20	0.07
Gains larger than 2.72%	86	5.21	-0.90	0.30	-0.30

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. 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.

Exhibit 13: Performance metrics of 50/50 blend (S&P 500 Dividend Aristocrats Index and S&P 500 Equal Weight Index).

METRIC	S&P 500	S&P 500 DIVIDEND ARISTOCRATS	S&P 500 EQUAL WEIGHT	50%S&P 500 DIVIDEND ARISTOCRATS/50% S&P 500 EQUAL WEIGHT
CAGR (%)	9.43	11.93	11.30	11.72
Mean (%)	10.16	12.22	12.13	12.19
Standard Deviation (%)	14.82	13.37	16.51	14.47
Mean/SD	0.686	0.914	0.735	0.842
Beta	1.00	0.76	1.05	0.90
R-squared	1.00	0.72	0.89	0.86
Tracking Error (%)	-	7.30	5.06	5.18

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. 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.

"LESS EQUAL" FACTOR PAIRS

Not all factors pair up so compatibly, and the correlation of their excess returns is an imperfect guide. The correlation of the return spreads of the S&P 500 Dividend Aristocrats Index and those of the S&P 500 Quality Index was 0.41 (virtually identical to the correlation of the S&P 500 Dividend Aristocrats Index and S&P 500 Equal Weight Index). However, the Dividend Aristocrats and Quality are both risk mitigators, so we might expect the benefit of diversification to be much less. Return spreads for both factors are inversely related to the returns of the S&P 500 (see Exhibit 14).

Exhibit 14: Performance of the S&P 500 Dividend Aristocrats Index and S&P 500 Quality Index in various market environments.

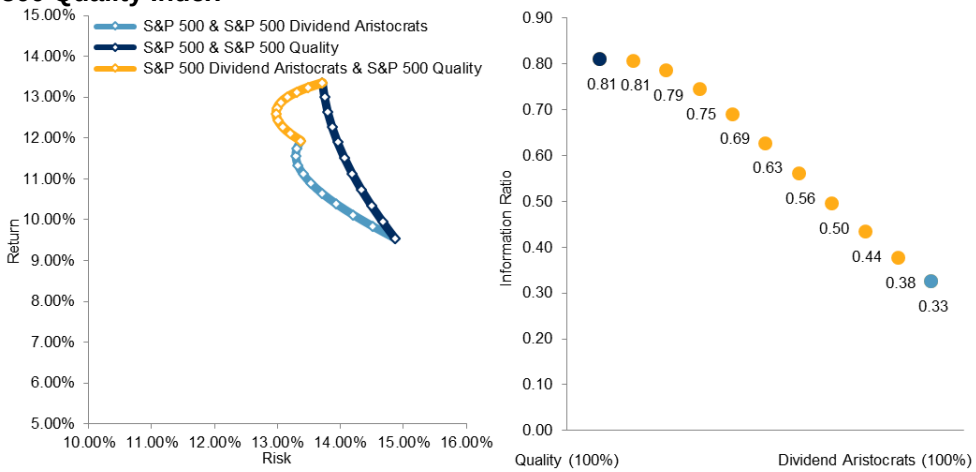
ENVIRONMENT	COUNT OF MONTHS	RETURN (%)				
		S&P 500	S&P 500 DIVIDEND ARISTOCRATS	S&P 500 QUALITY	S&P 500 DIVIDEND ARISTOCRATS MINUS S&P 500	S&P 500 QUALITY MINUS S&P 500
Declines larger than -2.55%	46	-6.04	-4.17	-4.83	1.87	1.21
Declines between -2.55% and 0%	46	-1.41	-0.64	-0.79	0.76	0.62
Gains between 0% and 2.72%	86	1.35	1.29	1.39	-0.06	0.04
Gains larger than 2.72%	86	5.21	4.32	5.02	-0.90	-0.20

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. 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.

Exhibit 15 looks strange, but perhaps strangeness should not be unexpected. There is relatively little diversification benefit from combining two relatively similar indices.

There is relatively little diversification benefit from combining two similar indices.

Exhibit 15: Efficient frontiers – S&P 500 Dividend Aristocrats Index and S&P 500 Quality Index



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As such, combining the two indices did not mitigate the shortcomings of either strategy (see Exhibit 16). The resulting combination was still largely defensive and still underperformed in the best-performing months.

Exhibit 16: Performance of 50/50 combination of S&P 500 Dividend Aristocrats Index and S&P 500 Quality Index in various market environments.

ENVIRONMENT	COUNT OF MONTHS	RETURN (%)			
		S&P 500	S&P 500 DIVIDEND ARISTOCRATS MINUS S&P 500	S&P 500 QUALITY MINUS S&P 500	50& S&P 500 DIVIDEND ARISTOCRATS/ 50% S&P 500 QUALITY
Declines larger than -2.55%	46	-6.04	1.87	1.21	1.56
Declines between -2.55% and 0%	46	-1.41	0.76	0.62	0.70
Gains between 0% and 2.72%	86	1.35	-0.06	0.04	0.00
Gains larger than 2.72%	86	5.21	-0.90	-0.20	-0.54

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. 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.

An advantage of this combination technique is its simplicity; a drawback is that a clever model builder can probably improve on the simple technique's performance.

A 50/50 combination of the two indices, yields performance that beat Dividend Aristocrats but underperformed Quality, with a higher tracking error than Quality alone (see Exhibit 17).

Exhibit 17: Performance metrics of 50/50 blend (S&P 500 Dividend Aristocrats Index and S&P 500 Quality Index).

METRIC	S&P 500	S&P 500 DIVIDEND ARISTOCRATS	S&P 500 QUALITY	50%S&P 500 DIVIDEND ARISTOCRATS/50% S&P 500 QUALITY
CAGR (%)	9.43	11.93	13.35	12.73
Mean (%)	10.16	12.22	13.54	12.89
Standard Deviation (%)	14.82	13.37	13.71	12.99
Mean/SD	0.686	0.914	0.988	0.992
Beta	1.00	0.76	0.87	0.81
R-squared	1.00	0.72	0.88	0.87
Tracking Error (%)	-	7.30	4.69	5.07

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, through Dec. 31, 2016. 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.

CONCLUSION

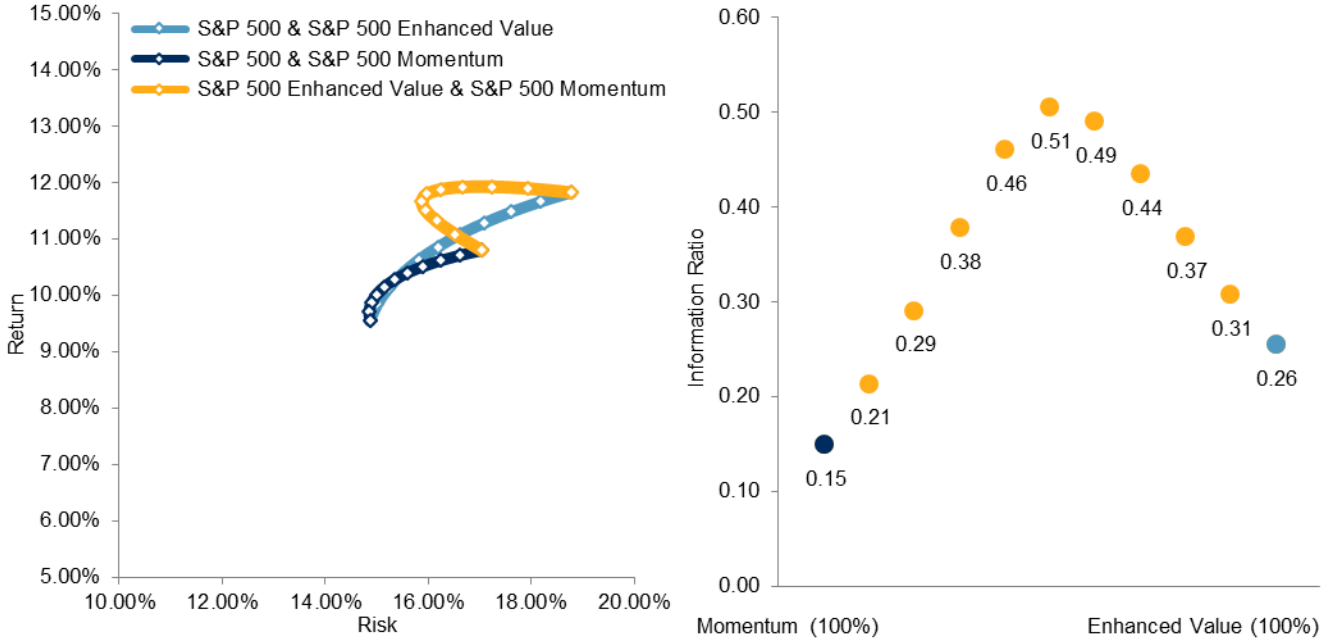
Simply combining single-factor indices, as highlighted in this paper, is by no means the only approach by which multiple factors can be exploited. An advantage of this combination technique is its simplicity; a drawback is that a clever model builder[13] can probably improve on the simple technique's performance.

Another advantage of the simple approach is that it offers flexibility in customizing exposures. One investor might like a 50/50 split between the S&P 500 Low Volatility Index and S&P 500 Momentum Index; another might prefer to tilt more decisively to one or the other. Combining single-factor indices is an efficient way to allow that to happen.

[13] See Innes, *op. cit*.

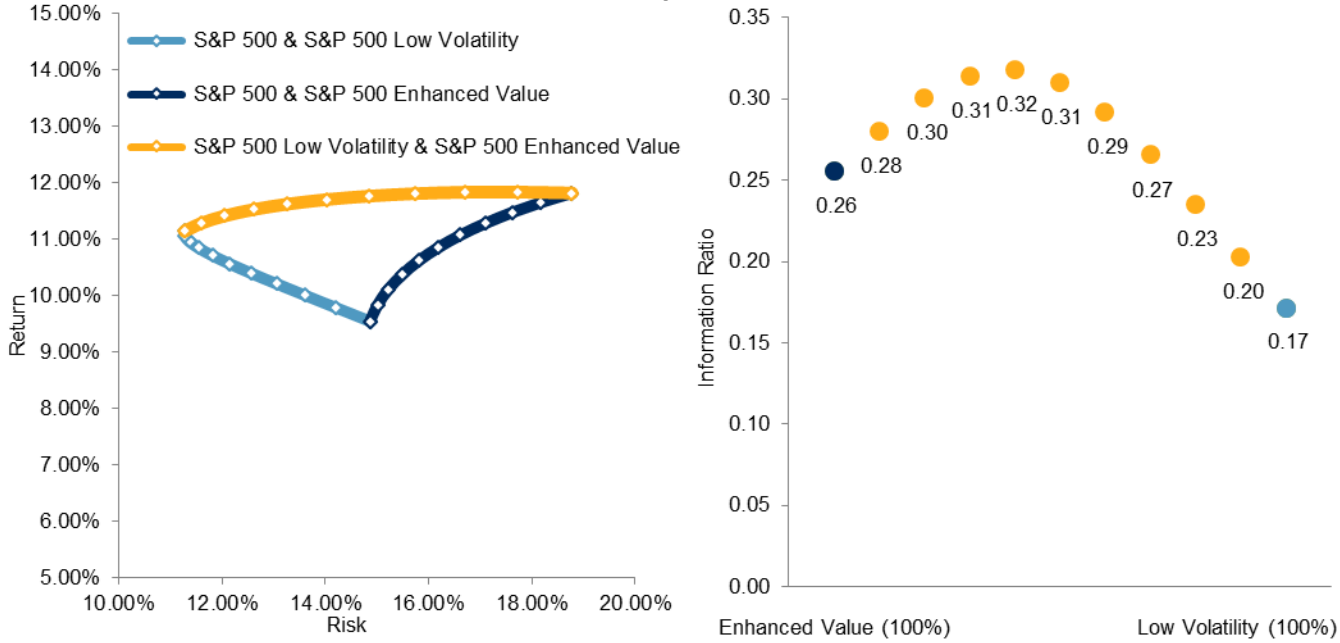
APPENDIX: OTHER FACTOR COMBINATIONS

Exhibit 18: Efficient frontiers – S&P 500 Enhanced Value Index and S&P 500 Momentum Index



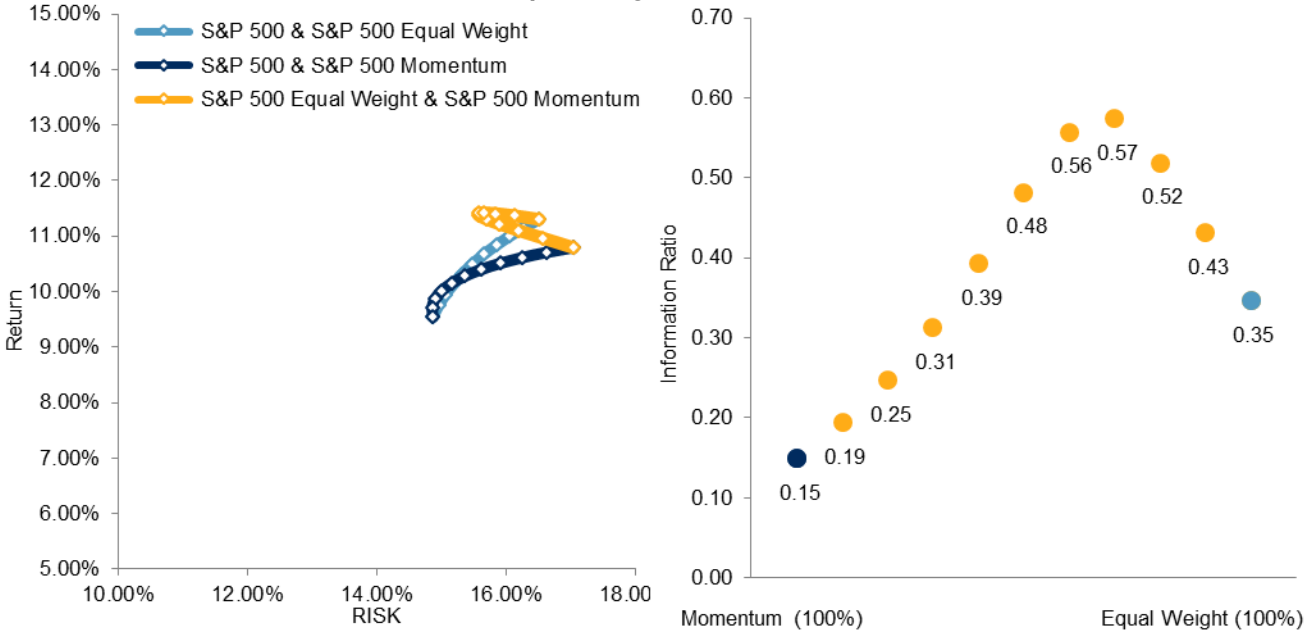
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 1994, through Dec. 31, 2016. Past performance is no guarantee of future results. Charts are provided for illustrative purposes and reflect hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibit 19: Efficient frontiers – S&P 500 Low Volatility Index and S&P 500 Enhanced Value Index



Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 1994, through Dec. 31, 2016. Past performance is no guarantee of future results. Charts are provided for illustrative purposes and reflect 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.

Exhibit 20: Efficient frontiers – S&P 500 Equal Weight Index and S&P 500 Momentum Index



Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 1994, through Dec. 31, 2016. Past performance is no guarantee of future results. Charts are provided for illustrative purposes and reflect 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.

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PERFORMANCE DISCLOSURE

The S&P 500 High Beta Index and S&P 500 Low Volatility Index were launched on April 4, 2011. The S&P 500 Quality Index was launched on July 8, 2014. The S&P 500 Dividend Aristocrats was launched on May 2, 2005. The S&P 500 Enhanced Value Index was launched on April 27, 2015. The S&P 500 Equal Weight Index was launched on January 8, 2003. The S&P 500 Momentum was launched on November 18, 2014. 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.

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 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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