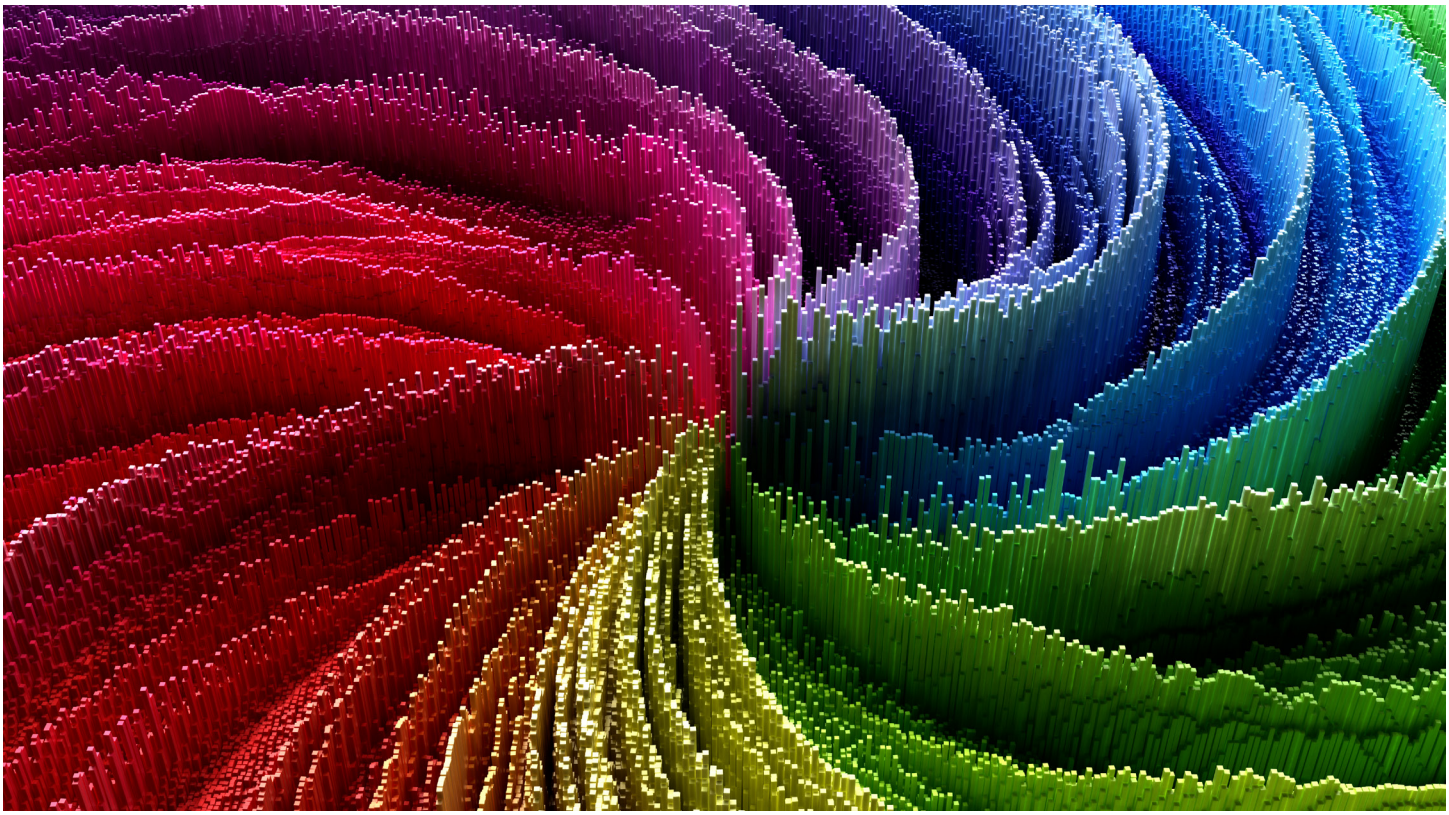


The Merits and Methods of Multi-Factor Investing

Andrew Innes
S&P Dow Jones Indices

The Risk of Choosing Between Single Factors

Given the unique cycles across the returns of single-factor strategies, how can those market participants without a factor view avoid putting all their eggs in the wrong basket?

The Cyclicality of S&P DJI's Single-Factor Indices

Single-factor equity strategies have been widely adopted to harvest the unique risk premium of a particular systematic factor that could reward market participants over time. Out of the widely accepted equity factors extensively studied in academic literature,[1] S&P DJI's single-factor index offerings include four key factors: quality, value, momentum, and low volatility.[2] The application of these single-factor strategies in the form of simple, rules-based indices has enabled market participants to seek active returns while benefiting from the low-cost, transparent methodology of passive investing.[3]

As seen in Exhibit 1, all of the long-term equity factors have distinct active returns that have all been susceptible to significant periods of underperformance relative to the S&P 500. Each factor exhibits unique cycles that can be attributed to the market environment[4] and corresponding stage in the economic cycle.[5] Therefore, single-factor strategies may be better suited to market participants with long time horizons, given their potential for long cyclical drawdowns. It is also worth noting that the active returns of each factor have varied greatly over the long term, and it may be incorrect to assume their relative strengths will continue indefinitely.

Using Multi-Factor Combinations to Diversify Risk

As the story of factor-based investing progresses, advocates of these systematic return

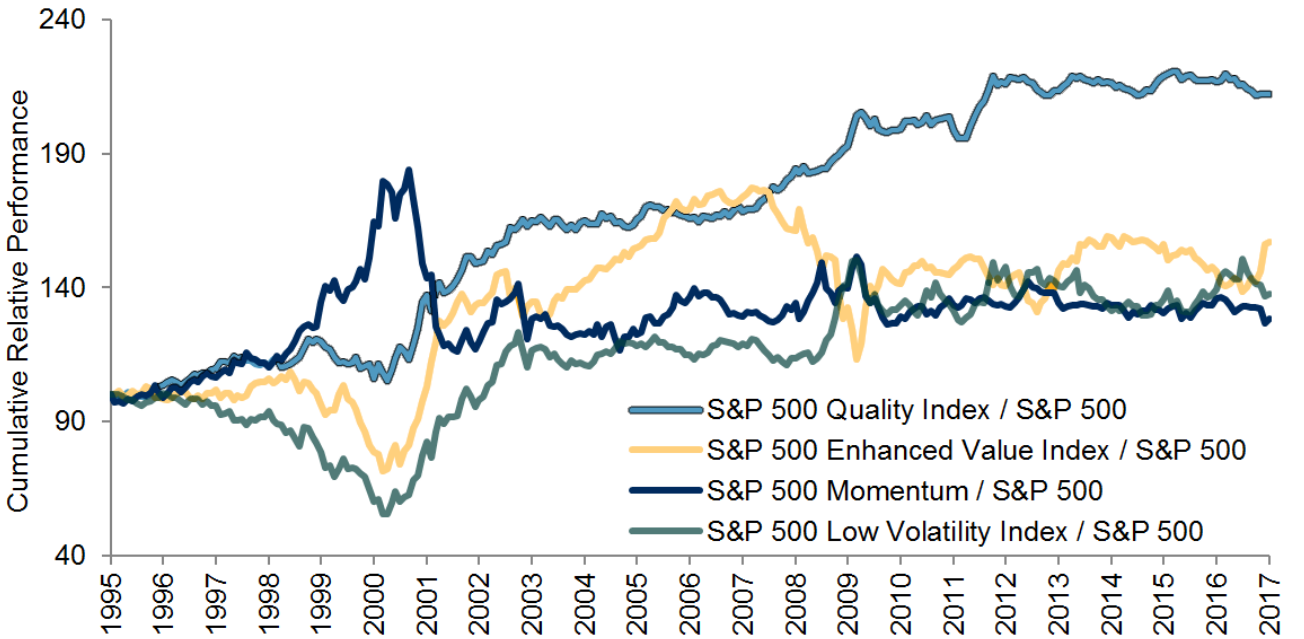


Exhibit 1: The S&P 500 Single-Factor Indices Have Unique Active Returns
Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, to Jan. 31, 2017. Performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects 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.

drivers are increasingly looking to multi-factor combinations to seize upon the potential diversification benefits. In much the same way as combining different asset classes, each with its own risk/return profile, the returns of many of the established equity factors can be combined in an attempt to diversify the portfolio and provide more stable excess returns. Fortunately, most equity factor returns have low correlations, particularly in times of market stress.[6]

Thus, one can logically deduce that using multiple equity factors as building blocks when creating a combined diversified portfolio may allow market participants to increase the frequency of outperformance over shorter time horizons.

Introducing a Multi-Factor Index of Indices Approach

Until recently, market participants wishing to gain exposure to multiple factors and motivated by the diversification benefits of a combined approach have primarily done so by managing their allocations to a collection of single-factor strategies. This approach represents a multi-factor index of indices, in which each underlying index contains constituents chosen based only on a single factor. For our example below, we have created a multi-factor index of indices with equal weights between the S&P 500 Quality Index, S&P 500 Enhanced Value Index, S&P 500 Momentum, and S&P 500 Low Volatility Index (rebalanced semi-annually). As each of the S&P 500 single-factor indices contains the top 100 stocks, our combined portfolio may contain up to 400 stocks (although there are generally substantially fewer, owing to crossover of constituents between the indices).

Multi-Factor Strategy Outperformed More Frequently Than Single-Factors

Exhibit 2 shows that the single-factor indices often outperformed the S&P 500 on a risk-adjusted basis over most time horizons during the period studied. However, the frequencies of risk-adjusted outperformance were notably lower for shorter holding periods, with frequencies less than 50% for the enhanced value and momentum factors over one- to five-year rolling windows. Interestingly, the outperformance frequencies varied greatly between the different factor indices. For example, across all the five-year investment windows, the quality and low volatility indices outperformed 98% and 92% of the time, respectively, while the enhanced value and momentum indices only outperformed 45% and 48% of the time, respectively. This suggests that market participants would have needed significant foresight when allocating tactically between the factors to ensure that they were exposed to the winning factors at the right time.

Fortunately, for those with an agnostic view regarding factors, the index of indices represents an alternative approach that fared as well as or better than the best-performing single factor over all horizons.[7] The diversification benefit of holding equal exposure between the four single-factor indices (rebalanced semiannually)

ROLLING WINDOW	S&P 500 QUALITY INDEX	S&P 500 ENHANCED VALUE INDEX	S&P 500 MOMENTUM	S&P 500 LOW VOLATILITY INDEX	INDEX OF INDICES
1 Year	65.7%	47.2%	48.0%	59.4%	79.5%
3 Years	78.7%	44.3%	40.9%	77.8%	96.5%
5 Years	97.6%	45.1%	48.1%	92.2%	100.0%
10 Years	100.0%	54.1%	63.0%	100.0%	100.0%
15 Years	100.0%	86.0%	64.0%	100.0%	100.0%

Exhibit 2: Frequency of Risk-Adjusted Outperformance to the S&P 500 Over Varying Time Horizons
Index of indices is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Average of monthly rolling data from Dec. 31, 1994, to Jan. 31, 2017. 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.

contributed to its outperformance to the S&P 500 on a risk-adjusted basis 80% of the time over a one-year period and 97% of the time over a three-year period.

Factor Exposure Dilutions in a Multi-Factor Index of Indices

The relative simplicity and lack of required factor view when adopting an equal-weighted, multi-factor index of indices approach may be compelling to market participants. However, combining single-factor indices to create a multi-factor index of indices results in a portfolio of stocks that are only selected based on their merits with regard to a single factor. Therefore, since their exposures to desired secondary factors could be relatively weak, the combined portfolio may suffer from a dilution effect in overall factor exposures.

Low Secondary Factor Exposures in Single-Factor Indices

There are several ways to measure the factor exposures within a portfolio; for instance, one could calculate the regression coefficients with respect to each of the desired factor returns. However, since our concern is focused on index construction, it seems prudent to measure factor exposures in terms of the factor scores[8] of the selected stocks—much like how the top quintile is selected in S&P DJI's factor indices methodology.

Exhibit 3 shows the relative factor exposures of each top-quintile S&P 500 single-factor portfolio, expressed in terms of their weighted-average factor scores.

We can see that each top quintile portfolio generally had low secondary factor exposures. For instance, the top 100 stocks in the S&P 500 ranked in terms of their value score typically had below-average quality and momentum scores; their weighted-average ranks were at the 43rd percentile and 40th percentile, respectively. Unsurprisingly, it is unlikely that the best value stocks in the S&P 500 (or elsewhere) would have already experienced considerable price momentum or be considered of the highest quality. Similar rationale can help us understand other low or negative correlations between the various factor combinations.

Diluted Net Exposures in a Multi-Factor Index of Indices

Exhibit 4 shows the weighted-average factor z-score percentiles for an index of indices containing quality, value, and momentum.

PORTFOLIO	WEIGHTED-AVERAGE PERCENTILE RANK OF FACTOR Z-SCORES			
	QUALITY	ENHANCED VALUE	MOMENTUM	LOW VOLATILITY
Top Quintile S&P 500 Quality Index	91	33	57	64
Top Quintile S&P 500 Enhanced Value Index	43	90	40	49
Top Quintile S&P 500 Momentum	54	32	91	58
Top Quintile S&P 500 Low Volatility Index	59	42	57	91

Exhibit 3: Factor Scores of Top-Quintile, Single-Factor Portfolios

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, to Jan. 31, 2017. Factor z-scores are calculated semi-annually according to S&P DJI's Single-Factor Index methodology and are expressed as a weighted average of their percentile ranks within the S&P 500. 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 lines representing factor exposures of the combined portfolio over time indicate considerable factor exposure dilution compared with the top quintile offered by the respective single-factor indices (see Exhibit 3). The average exposures to the desired factors in a multi-factor index of indices are comparable to second and third quintile stocks. In terms of the frequency of distribution for each desired factor, fewer than 40% of the stocks selected are in the top quintile. The significant distribution of stocks in the lower quintiles may be affecting portfolio performance.

An Alternative Multi-Factor Approach: Stock-Level Selection

Given that the negative correlation of factor scores appears to cause a degree of factor exposure dilution when adopting a multi-factor index of indices, we set out to examine whether there may be a more optimal approach to constructing a multi-factor index.

Target Multi-Factor Portfolio

Exhibit 5 illustrates the alternative selection process involved in a stock-level multi-factor strategy. This "bottom-up" process involves combining individual factor scores for each stock to create a multi-factor score. The multi-factor score is then used to select a more concentrated portfolio of "all-rounders," characterized by exposures that are fairly evenly distributed across all of the desired return drivers. The intention of this approach is to mitigate the factor exposure dilution inherent in a multi-factor index of indices.

In Exhibit 5, we used the example of quality, value, and momentum, but the same approach is applicable to any combination of equity factors. The area labeled "Target Multi-Factor Portfolio" in Exhibit 5 represents stocks that have characteristics of all the desired factors. In practice, there are often only a few stocks with high scores across all of the desired

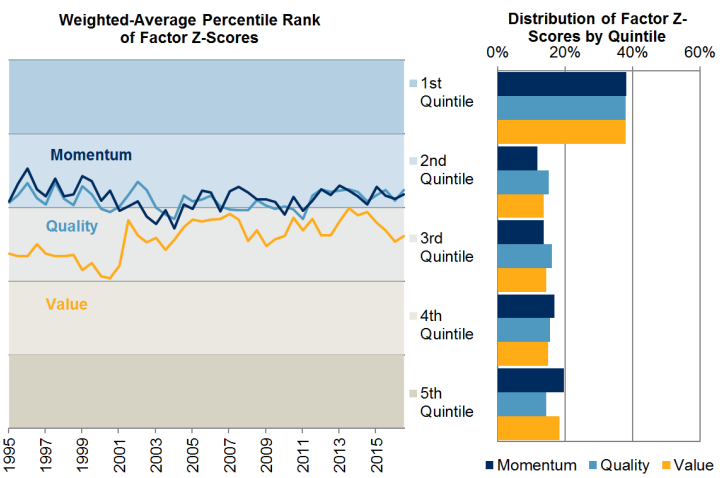


Exhibit 4: Factor Scores of Top-Quintile, Single-Factor Portfolios

Index of indices is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, to Jan. 31, 2017. Factor z-scores are calculated semi-annually according to S&P DJI's Single-Factor Index methodology and are expressed as a weighted average of their percentile ranks within the S&P 500. 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.

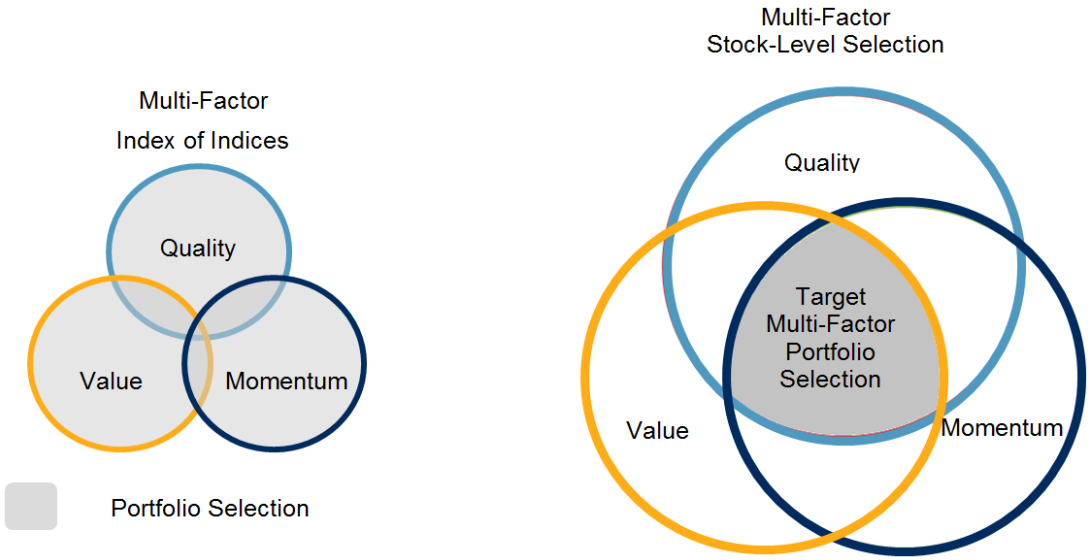


Exhibit 5: A Stock-Level, Multi-Factor Index Targets "All-Rounders"
Source: S&P Dow Jones Indices LLC. Chart is provided for illustrative purposes.

factors, so a compromise must be made to select sufficient stocks to construct a multi-factor portfolio in this way. This compromise may involve lowering the selection criteria for each factor score. Alternatively, selecting the top quintile based on the average of the desired factor scores would seek to find the stocks with the best combined factor characteristics without explicitly choosing a minimum score for any one factor.

Aims of the S&P Dow Jones Multi-Factor Index

While there may be myriad approaches to effectively combine equity risk factors, our aim, in the absence of any tactical factor viewpoint, is to capture high factor exposures across a range of selected equity factors through a simple constituent-level selection approach. In doing so, we seek to measure and compare the factor score exposures to the original multi-factor index of indices approach, while ensuring reasonably fair exposure across the desired return drivers. Each approach will ultimately be judged most viable with respect to the market participants' objectives by comparing the portfolio's risk/return characteristics.

Introducing the S&P 500 Quality, Value & Momentum Multi-Factor Index

The S&P 500 Quality, Value & Momentum Multi-Factor Index is an example of a stock-level selection process. In general terms, this index takes an average of the standardized scores across all three factors for the S&P 500 and then selects the top quintile. The index is rebalanced semi-annually and is weighted with respect to the product of its multi-factor score and its float market capitalization.[9]

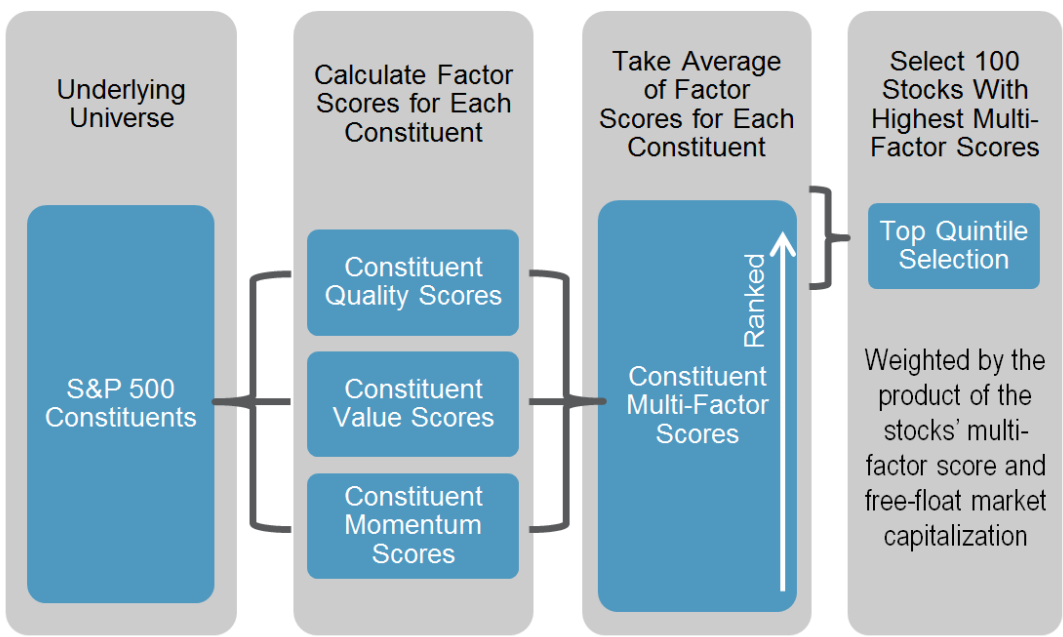
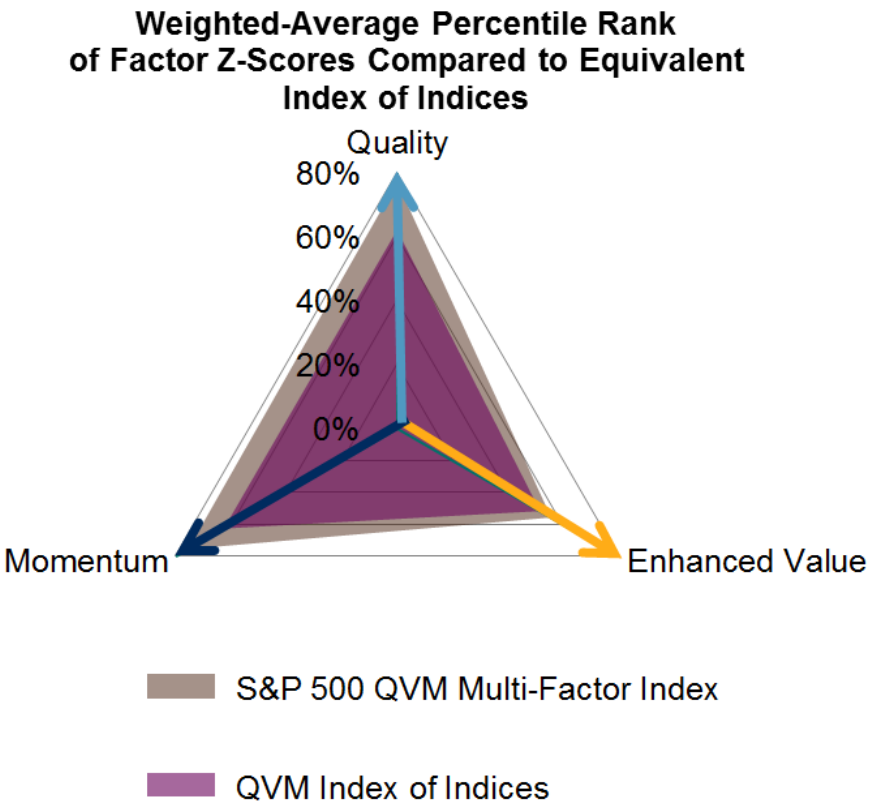


Exhibit 6: S&P 500 Quality, Value & Momentum Multi-Factor Index Simplified Selection Process
Source: S&P Dow Jones Indices LLC. Chart is provided for illustrative purposes.



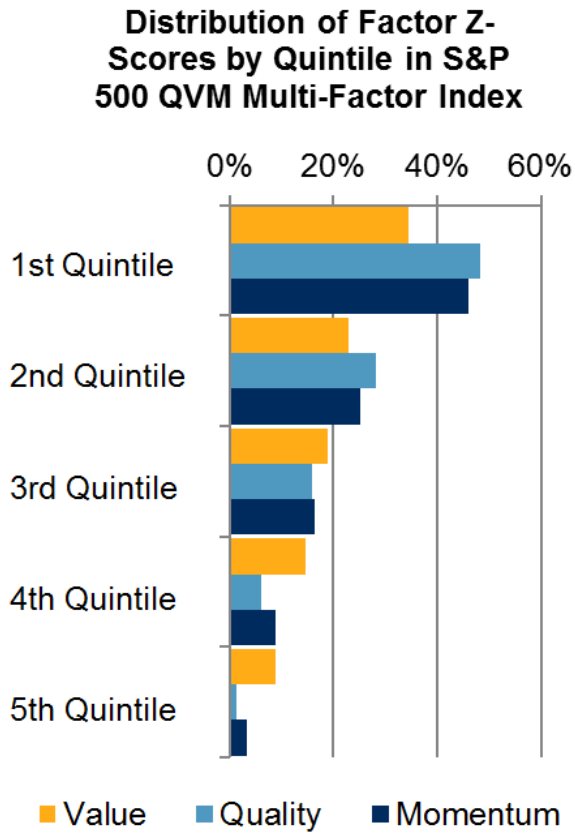


Exhibit 7: Improved Factor Exposures of the S&P 500 Quality, Value & Momentum Multi-Factor Index
QVM Index of Indices is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, to Jan. 31, 2017. Factor z-scores for the constituents of the S&P 500 Quality, Value & Momentum Multi-Factor Index are calculated semiannually according to S&P DJI's Single-Factor Index methodology and are expressed as a weighted-average of their percentile ranks within the S&P 500. The QVM Index of Indices is an equal-weight portfolio that includes the S&P 500 Quality Index, S&P 500 Enhanced Value Index and S&P 500 Momentum that is rebalanced semi-annually. 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 7 shows the distribution of stocks selected in the S&P 500 Quality, Value & Momentum Multi-Factor Index in terms of their factor z-score percentile ranks. Compared with Exhibit 4, it is evident there is an improvement in the number of higher-quintile z-scores across the desired factors when using a stock-level selection process versus an index of indices approach. We also see a reduction in the number of lower-quintile z-scores being selected, compared with the index of indices.

To help quantify this observation, we took a weighted average of the factor z-score percentile ranks. The resultant values (representing factor exposures) are notably superior to an equivalent index of indices, with 77% for quality, 56% for enhanced value, and 76% for momentum (compared with 62%, 52%, and 63%, respectively, for the index of indices).

It is worth noting that the value factor was relatively under-represented, due to it having a more negative correlation in z-scores with quality and momentum (see Exhibit 3). Alternative index construction methods that seek to balance this exposure would ultimately have to make further compromises in selecting lower-percentile stocks for quality and momentum.

Risk/Return Comparison of Multi-Factor Approaches

To analyze the impact of the two approaches to constructing multi-factor indices, we compared the risk/return characteristics of each. To represent our stock-level selection index, we used the S&P 500 Quality, Value & Momentum Multi-Factor Index. An equal-weighted portfolio (rebalanced semi-annually) consisting of the S&P 500 Quality Index, S&P 500 Enhanced Value Index, and S&P 500 Momentum (referred to as "QVM Index of Indices") was used as an equivalent index of indices approach.

Comparison of Portfolio Risk/Return Characteristics

To eliminate any concerns about choosing an arbitrary start date to calculate each portfolio's risk/return characteristics, we instead used rolling 5-, 10-, and 15-year windows over the full available back-tested history, starting on Dec. 31, 1994. This also allows us to appreciate the impact of the investment time horizon on the results.

It is evident from Exhibit 9 that the risk-adjusted returns for the S&P 500 Quality, Value & Momentum Multi-Factor Index were greater than those of the QVM Index of Indices for all the

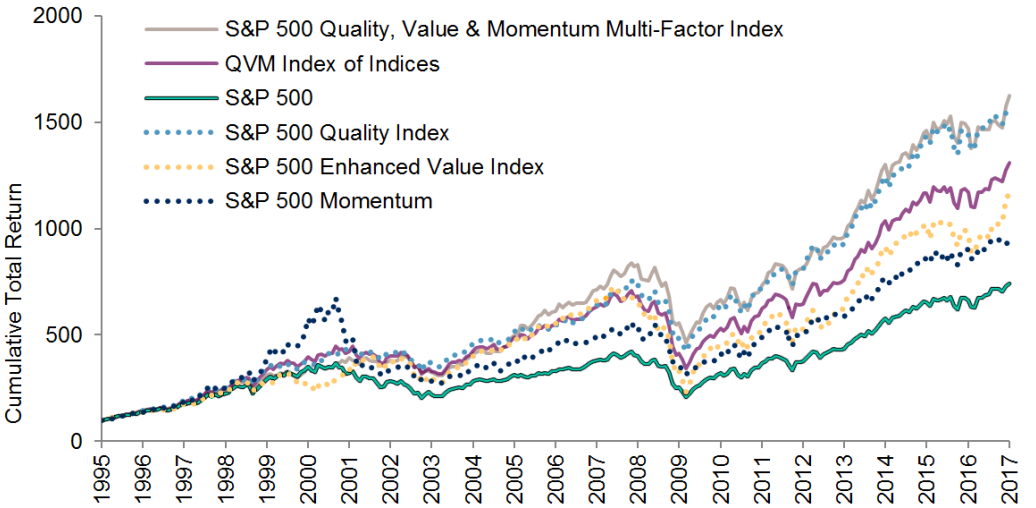


Exhibit 8: S&P 500 Quality, Value & Momentum Index Compares Favorably to the Best-Performing Single-Factor Index

QVM Index of Indices is a hypothetical portfolio.

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1994, to Jan. 31, 2017. Index performance based on total return in USD. 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 QVM Index of Indices is an equal-weight portfolio that includes the S&P 500 Quality Index, S&P 500 Enhanced Value Index, and S&P 500 Momentum that is rebalanced semiannually.

ROLLING WINDOW	S&P 500	S&P 500 QUALITY INDEX	S&P 500 ENHANCED VALUE INDEX	S&P 500 MOMENTUM	QVM INDEX OF INDICES	S&P 500 QUALITY, VALUE & MOMENTUM MULTI-FACTOR INDEX
AVERAGE TOTAL RETURNS (%, ANNUALIZED)						
5 Years	6.90	11.10	9.40	8.00	9.90	11.50
10 Years	5.50	9.70	8.10	6.20	8.40	10.80
15 Years	5.50	9.90	8.20	6.10	8.50	10.50
AVERAGE VOLATILITY (%, ANNUALIZED)						
5 Years	15.30	14.00	19.50	17.30	15.20	14.10
10 Years	15.30	14.00	19.90	17.20	15.40	14.20
15 Years	15.70	14.20	20.40	17.60	15.70	14.40
AVERAGE RISK/RETURN (ANNUALIZED)						
5 Years	0.52	0.84	0.59	0.53	0.72	0.88
10 Years	0.36	0.70	0.43	0.37	0.56	0.77
15 Years	0.35	0.69	0.4	0.35	0.54	0.73
AVERAGE TRACKING ERROR TO S&P 500 (%, ANNUALIZED)						
5 Years	-	5.00	9.90	9.20	3.50	6.50
10 Years	-	5.00	10.00	9.40	3.60	6.80
15 Years	-	5.30	10.30	9.70	3.70	7.10
AVERAGE INFORMATION RATIO TO S&P 500 (ANNUALIZED)						
5 Years	-	0.72	0.3	0.09	0.73	0.56
10 Years	-	0.75	0.27	0.05	0.71	0.66
15 Years	-	0.72	0.29	0.04	0.75	0.61
MAXIMUM DRAWDOWN (MONTHS)						
Full Period	-	39	70	154	51	51
ONE-WAY TURNOVER (%, APPROXIMATE)						
Full Period	-	62	32	118	71	98

Exhibit 9: S&P 500 Single and Multi-Factor Portfolio Risk/Return Characteristics Comparison

QVM Index of Indices is a hypothetical portfolio.

Source: S&P Dow Jones Indices LLC. Rolling window data is the average of annualized figures on a monthly basis from Dec. 31, 1994, to Jan. 31, 2017. 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 QVM Index of Indices is an equal-weight portfolio that includes the S&P 500 Quality Index, S&P 500 Enhanced Value Index, and S&P 500 Momentum that is rebalanced semiannually.

rolling time horizons analyzed. Over a 15-year rolling window, the risk-adjusted return figures were 0.73 and 0.54, respectively. These results help support the view that a stock-level multi-factor selection process may reduce dilution of desired factor exposures compared with an index of indices approach, potentially allowing investors to harvest more of the factors' collective risk premia.

In Exhibit 10, the diagonal line represents all points with risk-adjusted returns equal to the S&P 500. Points further above the diagonal line exhibit progressively better risk-adjusted returns compared with the S&P 500.

The compromise in achieving these superior risk-adjusted returns, however, has been increased tracking error to the benchmark. As the S&P 500 Quality, Value & Momentum Multi-Factor Index aims to select only the top quintile of stocks with the best combined factor characteristics, it is ultimately a far more concentrated portfolio than its index of indices counterpart. Therefore, the resultant index suffers from inferior information ratios compared with the index of indices, due to its relatively high tracking error.

Exhibit 11 shows the information ratios for the various single-factor and multi-factor indices over the rolling 15 year window. The diagonal line represents all points with equal information ratios to the S&P 500 Quality, Value & Momentum Multi-Factor Index.

In addition, it is clear the S&P 500 Quality Index competed equally well over all time horizons in terms of risk-adjusted returns and tracking error compared with both multi-factor indices. However, one could argue that holding only this single factor as opposed to other less-successful factors over this period would have required considerable foresight and skill. Therefore, depending on the investment objectives of market participants without a factor viewpoint, one of the multi-factor index approaches could have provided a viable alternative.

Multi-Factor Performance in Various Factor Regimes

Exhibit 12 further illustrates the benefits of combining multiple factors and highlights the improved historical performance of our stock-level approach. Although the S&P 500 Quality, Value & Momentum Multi-Factor Index only outperformed the benchmark in 20% of the months in which none of the corresponding single-factor indices outperformed, these periods represent a mere 8% of the total back-test.

More importantly, in periods when two or three of the single factors outperformed the S&P 500 (representing 59% of the back-test), the multi-factor index outperformed in 66% and 83% of the months, respectively. The average monthly outperformance of the S&P 500 Quality, Value & Momentum Multi-Factor Index in those periods was superior to achieving an average of the single-factor returns.

Analysis of Active Sector Exposures

To assess the differences in sector diversification between the two multi-factor approaches, Exhibit 13 shows their average active sector exposures to the S&P 500. The single-factor indices' average active sector exposures are also given for comparison.

The index of indices approach has the lowest average magnitude of active sector bets between all of the factor portfolios. This finding aligns with the low tracking error of the index of indices portfolio owing to its relatively high number of constituents.

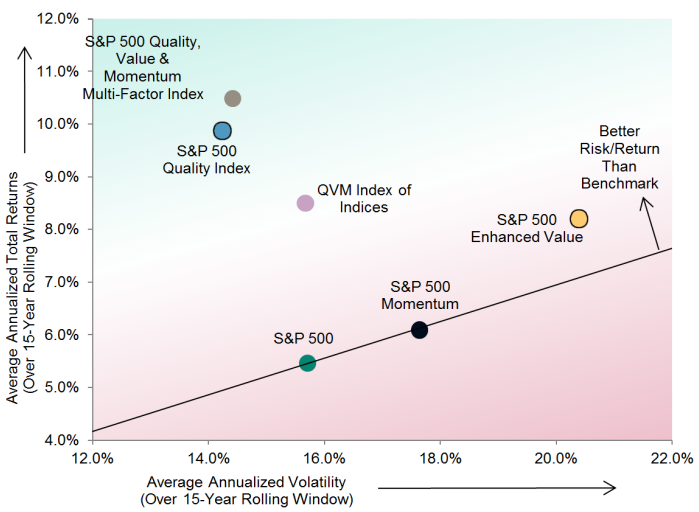


Exhibit 10: S&P 500 Single- and Multi-Factor Average Risk/ Return

QVM Index of Indices is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Rolling window data is the average of annualized figures on a monthly basis from Dec. 31, 1994, to Jan. 31, 2017. Index performance based on total return in USD. 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 QVM Index of Indices is an equal-weight portfolio that includes the S&P 500 Quality Index, S&P 500 Enhanced Value Index, and S&P 500 Momentum that is rebalanced semiannually.

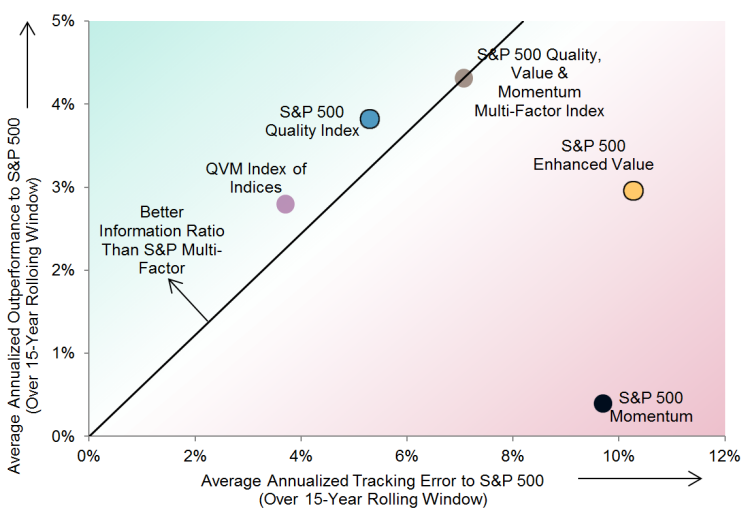


Exhibit 11: S&P 500 Single- and Multi-Factor Average Information Ratios

QVM Index of Indices is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Rolling window data is the average of annualized figures on a monthly basis from Dec. 31, 1994, to Jan. 31, 2017. Performance based on total return in USD. 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 QVM Index of Indices is an equal-weight portfolio that includes the S&P 500 Quality Index, S&P 500 Enhanced Value Index, and S&P 500 Momentum that is rebalanced semiannually.

REGIMES	0 FACTORS OUTPERFORM	1 FACTOR OUTPERFORMS	2 FACTORS OUTPERFORM	3 FACTORS OUTPERFORM
Number of Months (since Dec. 31, 1994)	20	88	116	41
% of Months (of total back-test)	8	33	44	15
% of Months S&P 500 Quality, Value & Momentum Multi-Factor Index Outperforms (Hit Rate)	20	51	66	83
Average Monthly S&P 500 Quality, Value & Momentum Multi-Factor Index Outperformance (%)	-0.93	-0.37	0.58	1.59
Average Monthly Single-Factor Index Outperformance (%; index of indices approach)	-0.89	-0.37	0.48	1.23

Exhibit 12: S&P 500 Quality, Value & Momentum Multi-Factor Index Relative Performance to S&P 500 in Various Single-Factor Regime Combinations

Index of indices is a hypothetical portfolio.

Source: S&P Dow Jones Indices LLC. Rolling window data is the average of annualized figures on a monthly basis from Dec. 31, 1994, to Jan. 31, 2017. 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 index of indices is an equal-weight portfolio that includes the S&P 500 Quality Index, S&P 500 Enhanced Value Index, and S&P 500 Momentum that is rebalanced semiannually.

SECTOR	S&P 500 QUALITY INDEX	S&P 500 ENHANCED VALUE INDEX	S&P 500 MOMENTUM	QVM INDEX OF INDICES	S&P 500 QUALITY, VALUE & MOMENTUM MULTI-FACTOR INDEX
Energy	-1.3%	0.6%	-0.7%	-0.5%	3.3%
Materials	0.6%	1.8%	-0.7%	0.6%	0.5%
Industrials	1.1%	-4.4%	-1.2%	-1.5%	0.9%
Consumer Staples	7.1%	-3.1%	-0.1%	1.3%	4.2%
Consumer Discretionary	1.9%	3.4%	3.1%	2.8%	4.1%
Health Care	5.0%	-5.4%	0.4%	0.0%	-1.6%
Financials	-12.5%	17.1%	-4.0%	0.2%	-1.7%
Information Technology	3.9%	-14.6%	3.3%	-2.4%	-9.2%
Telecommunication Services	-3.0%	-0.9%	-0.7%	-1.5%	-1.3%
Utilities	-2.8%	5.4%	0.5%	1.1%	0.9%
Average Magnitude	3.9%	5.7%	1.5%	1.2%	2.8%

Exhibit 13: S&P 500 Single and Multi-Factor Indices Average Active Sector Exposure Relative to the S&P 500

QVM Index of Indices is a hypothetical portfolio.

Source: S&P Dow Jones Indices LLC. Rolling window data is the average of annualized figures on a monthly basis from Dec. 31, 1994, to Jan. 31, 2017. 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 QVM Index of Indices is an equal-weight portfolio that includes the S&P 500 Quality Index, S&P 500 Enhanced Value Index, and S&P 500 Momentum that is rebalanced semiannually.

Comparing the stock-level, multi-factor approach to other top quintile single-factor portfolios, it is evident that the average magnitude of its active sector bets are lower than the S&P 500 Quality Index and S&P 500 Enhanced Value Index; the S&P 500 Momentum, however, is more sector-neutral to the benchmark.

The results demonstrate that the diversification benefits of a multi-factor, stock-level approach may help lower the peak active sector bets compared with the worst-offending single-factor portfolios. However, active sector exposures could still be significant, and market participants may want to consider whether they are comfortable with these over/underweight allocations.

For instance, our stock-level, multi-factor strategy had an average underweight sector exposure of 9.2% in information technology and average overweight exposures to consumer staples and consumer discretionary stocks of approximately 4% each during the period studied. These allocations may also vary greatly through time, as the index attempts to capture the highest factor-combinations in whichever sectors they may appear.

Conclusion

Market participants seeking to target the systematic equity risk premia associated with single factors should understand that historical performances for each factor have been cyclical and have experienced long drawdowns relative to the market. The active returns of each factor have generally displayed low or negative correlations, as they respond differently to the market environment and economic cycles. Hence, market participants adopting a multi-factor approach may reap considerable diversification benefits. Alternatively, market participants wishing to be selective about single equity factors may want to either have long investment horizons or high conviction in their decisions.

As an alternative to choosing between equity factors, multi-factor portfolios can be constructed to diversify factor risk. Market participants considering multi-factor investing should explore the differences between the index of indices approach and the stock-level multi-factor approach. Our analysis shows that those wishing to minimize tracking error relative to the benchmark could have experienced higher probabilities of risk-adjusted outperformance over varying time horizons with a multi-factor index of indices approach. However, since exposure to desired secondary factors could be weak in each single-factor index, a multi-factor index of indices may experience some factor exposure dilution.

The factor exposure dilutions inherent when simply holding multiple single-factor indices may be alleviated by opting to combine factor scores at the stock-level. The back-test of the S&P 500 Quality, Value & Momentum Multi-Factor Index has demonstrated superior risk-adjusted returns of 0.73 over the average of the 15-year rolling windows compared to 0.54 for the hypothetical index of indices approach. This supports the view that the stock-level index construction approach may help reduce factor exposure dilutions, but it may come with the cost of increased tracking error (increased to 7.1% from 3.7% for the index of indices).

For market participants without a factor viewpoint, both multi-factor approaches offered a viable alternative to the best-performing single-factor index. With both options offering a balanced exposure across multiple factors, the choice could be simplified to whether one wishes to maximize risk-adjusted returns on an absolute basis or relative to the benchmark. Ultimately, the decision between a multi-factor index of indices or our stock-level selection approach depends on the market participant's investment objectives.

In conclusion, multi-factor indices may help market participants avoid the potential pitfalls of choosing and timing factors without necessarily missing the upside that the best factor choice may have provided.

Future Innovations in Multi-Factor Indices

The rising popularity and appeal of factor-based indices is pushing innovation within the space of multi-factor investing. Along with expanding the multi-factor index range to encompass even more regions, different factor combinations could also be applied. These could even extend to non-traditional equity factors, such as incorporating ethical and sustainability investment themes in the environmental, social, and governance (ESG) field.[10]

Other areas of progress could include sector-neutral, multi-factor indices that aim to match their sector exposures with that of the corresponding benchmark. Risk model-based optimization methods could also be employed to minimize (or target) tracking error while maximizing exposure to the desired factors.

Advancements are also likely in strategies that isolate the factor risk premium. Market risk is a considerable portion of the overall risk in each of the multi-factor strategies discussed so far. However, the multi-factor risk premium can be isolated by taking a long position in the top quintile of multi-factor stocks and a short position in the lowest quintile. Alternatively, the overall market can be used for the short position, with its exposure matched to the beta of the long portfolio.

As awareness of the potential benefits of multi-factor indices continues to grow, along with the needs of market participants, we can expect ever more interesting and useful index strategies within this area.

Endnotes

1. For further details on factor theory, see Qian, E.E., Hua, R.H., Sorenson, E.H., (2007). Quantitative Equity Portfolio Management.

2. For more information, see the S&P Quality Indices methodology, S&P Enhanced Value Indices methodology, S&P Momentum Indices methodology, and S&P Low Volatility Index methodology.

3. For a thorough overview of equity factors and rationale, see our research paper, "The Story of Factor Based Investing" (Sunjiv Mainie, 2015).

4. Ung, Daniel and Priscilla Luk, "What Is In Your Smart Beta Portfolio? A Fundamental and Macroeconomic Analysis," 2016.

5. Asness, C., "Changing Equity Risk Premia and Changing Betas over the Business Cycle and January," University of Chicago Working Paper (1992).

6. To see more detail on the unique cycles and correlations between factors see our S&P Research paper "Blending Factors in Your Smart Beta Portfolio" (Cheng and Srivastava, 2016).

7. Performance comparison between the index of indices and the best-performing single factor is made in terms of the frequency of outperformance of risk-adjusted returns, as shown in Exhibit 2.

8. To create comparable data sets, the fundamental data within a factor score is standardized into a z-score, defined as the number of standard deviations each value is from its population mean. Using this approach, for example, the z-score of the accruals ratio, leverage, and return on equity can be averaged to provide a single quality score for a stock.

9. To see a more thorough overview of the methodology, please see the S&P 500 Quality, Value & Momentum Multi-Factor Index methodology.

10. For more information on ESG factors, see S&P DJI's "Understanding ESG Investing" by Emily Ulrich (2016).

Author Bio

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Andrew Innes is Associate Director, Global Research & Design (EMEA), at S&P Dow Jones Indices (S&P DJI). The group provides research on global index strategies across all asset classes and is responsible for the conceptualization and design of new index products.

Prior to joining the Global Research & Design team in 2016, Andrew worked in S&P DJI's Custom Index Development group, where he constructed index models to back-test and maintain a wide range of custom indices. Before that, Andrew worked in Portfolio Strategy and Equity Research at ISI Group, Relative Equity Analytics, and MainFirst Bank.

Andrew graduated from Loughborough University with a Bachelor of Engineering (Hons) in Automotive Engineering.