S&P Dow Jones Indices

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Index Education

Indexing GARP Strategies: A Practitioner's Guide

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THE GARP STRATEGY

Growth at a Reasonable Price (GARP) is a well-known, much-practiced investment approach. It is a fundamental-driven investment strategy that balances pure growth and pure valuation, as the former tends to invest in high-growth, yet expensive stocks, while the latter may take a long-term investment to pay off. Primarily, the GARP strategy favors investing in companies with consistent earnings and sales growth, reasonable valuation, and solid financial strength, combined with strong profitability. The underlying investment thesis of the S&P 500® GARP Index seeks to track the GARP strategy and earn higher risk-adjusted returns than its underlying universe over a long-term investment horizon.

In this paper, we introduce the S&P 500 GARP Index, its strategy, construction methodology, risk/return profile, factor exposures, and attribution analysis.

ESTABLISHING THE MULTI-FACTOR FRAMEWORK

We use a systematic bottom-up approach for stock selection and portfolio construction (see Exhibit 1), which we summarize as follows.

1. Define the investment universe (the S&P 500).
2. Identify factors with the potential to fulfill the GARP investment strategy.
3. Select sensible factors for multi-factor metrics.
4. Select constituents with well-defined rules.
5. Construct a constituent portfolio with a predefined weighting methodology.

Exhibit 1: Multi-Factor Investment Process

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

Exhibit 2 shows the style and factor components[1] for the GARP strategy.

We use three-year EPS and SPS growth metrics to capture a firm's growth…

Exhibit 2: Style and Factor Components of the S&P 500 GARP Index

STYLE	FACTOR COMPONENTS
Growth	1. Three-Year Earnings per Share (EPS) Growth 2. Three-Year Sales per Share (SPS) Growth
Quality & Value (QV) Composite	1. Financial Leverage Ratio 2. Return on Equity (ROE) 3. Earnings-to-Price Ratio

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

We use three-year EPS and SPS growth metrics to capture a firm's growth. In order to maintain sustainable growth, a firm needs to be highly profitable (high ROE) and not have excessive leverage (low financial leverage ratio). We also use the earnings-to-price ratio to gauge a firm's reasonable valuation. These factors effectively enact the characteristics of the GARP strategy.

…and financial leverage ratio, ROE, and earning-to-price ratio to gauge its reasonable valuation.

DATA AND METHODOLOGY

The underlying universe for our study is the S&P 500. To avoid survivorship bias, we include companies currently and historically in the benchmark. To prevent look-ahead bias, we lag the fundamental data by 45 days. Compustat is the main data source for company-level fundamental data.

STYLE AND FACTOR SCORE CALCULATIONS

Score calculation is an integral step of any multi-factor strategy. We calculate the growth z-score and QV composite z-score for each of the stocks in the eligible universe. The growth z-score is calculated as the winsorized z-score average of two factors: the three-year EPS growth and three-year SPS growth.[2] If a z-score for one factor is not available or properly calculated, the z-score of the other factor will be used as the growth z-score.

Next, we compute the QV composite z-score as the winsorized z-score average of three factors: financial leverage ratio, ROE, and earnings-to-price ratio. A stock needs to have quality and value scores. If the z-score for one of the quality scores is not available or properly calculated, the z-score of the other quality factor will be used.

With the style and factor scores in place, we proceed to the third step of the multi-factor investment process: security selection.

[1] Fundamental ratio and winsorization definitions are shown in Appendix A.

[2] Z-score computation details are shown in Appendix B.

MULTI-FACTOR SEQUENTIAL FILTERING PROCESS

There are a number of approaches to constructing multi-factor portfolios—integration,[3] sequential filtering, and optimization. For the S&P 500 GARP Index, we use the sequential filtering method, as it is simple, intuitive, and effective in providing the targeted factor exposures.

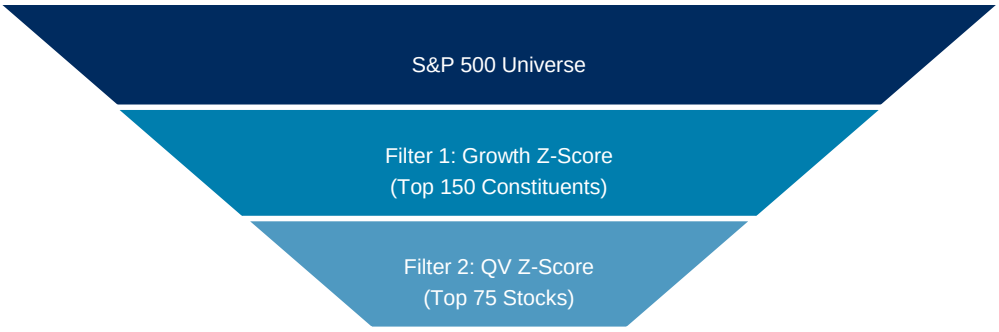
We use a multi-factor sequential filtering approach to implement the GARP strategy.

Multi-factor sequential filtering selects stocks using two layers of filters, as shown in Exhibit 3. In the first step (filter 1), stocks are ranked by their growth z-scores, with the top 150 stocks remaining eligible for constituent inclusion. In the second step (filter 2), those 150 stocks are then ranked by their QV composite z-scores. The top 75 stocks are selected to be included in the strategy after applying a 20% buffer rule.[4] The 20% buffer is applied to reduce portfolio turnover.

In filter 1, stocks are ranked by their growth z-scores, with the top 150 stocks remaining eligible for constituent inclusion…

…and in filter 2, those stocks are ranked by their QV composite z-scores, and the top 75 are selected.

Exhibit 3: Multi-Factor Sequential Filtering Process



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

CONSTITUENT WEIGHTS

Once constituents are selected (at the start and at each rebalance), eligible securities are weighted by their growth score[5] to achieve the strategy's growth exposure. To limit the impact of extreme values, the maximum weight of a security is capped at 5%. Individual Global Industry Classification Standard (GICS®) sector exposure (the constituent weight in each sector) is capped at 40% to broaden the strategy's sector exposure.

RETURN/RISK PROFILE

Back-tested results show that the GARP strategy has had higher cumulative returns than the underlying benchmark, as well as the S&P 500 Quality Index, S&P 500 Growth, and S&P 500 Enhanced Value Index (see Exhibit 4).

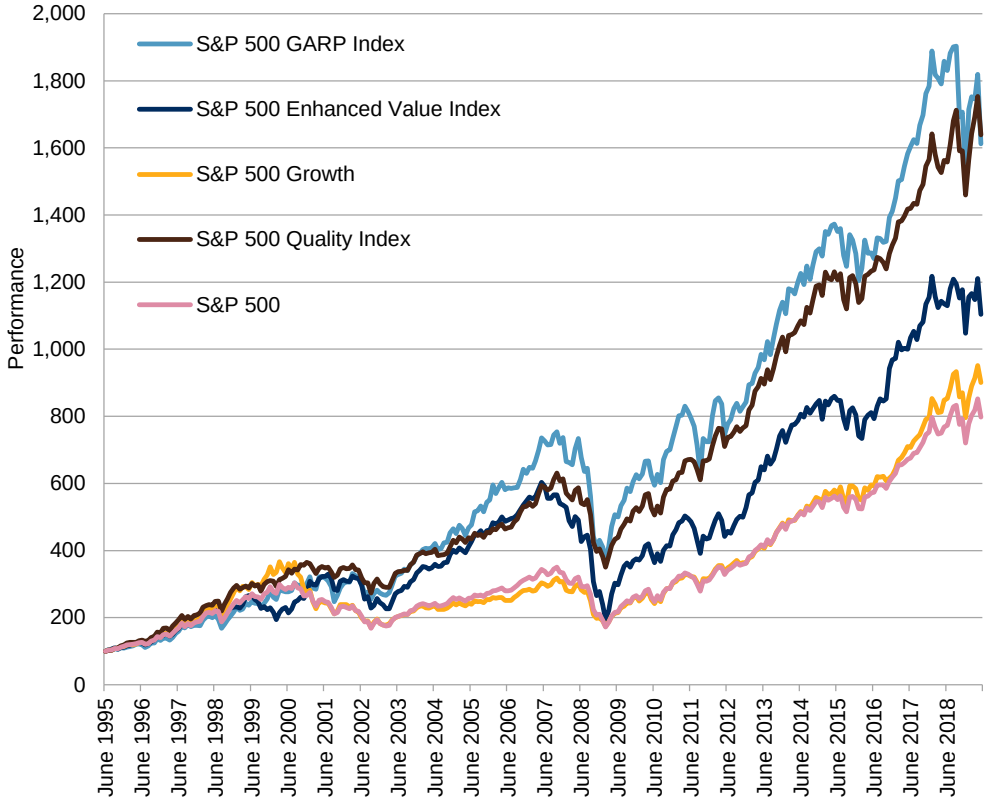
[3] Please see the S&P Quality, Value & Momentum Multi-Factor Indices Methodology for more information.

[4] Buffer rule is shown in Appendix C.

[5] Growth score computation details are shown in Appendix B.

Historically, the GARP strategy has delivered higher returns than its underlying benchmark...

Exhibit 4: Cumulative Performance of the S&P 500 GARP Index against Other S&P Factor Indices



…as well as other single factor indices.

Source: S&P Dow Jones Indices LLC. Data from June 30, 1995, to May 31, 2019. 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 S&P 500 GARP Index also had the highest annualized average return and the second-highest risk-adjusted returns.

Exhibit 5 shows the average risk/return profile of the S&P 500 GARP Index against the same set of indices as Exhibit 4. The S&P 500 GARP Index had the highest annualized average return (13.28%). On a risk-adjusted basis, the S&P 500 GARP Index ranked second (0.75) after the S&P 500 Quality Index (0.93), but was higher than the other factor indices—the S&P 500 Enhanced Value Index (0.64) and S&P 500 Growth (0.68)—as well as the S&P 500 (0.67).

Exhibit 5: Risk/Return Profile Comparison of S&P 500 GARP Index with Other S&P Factor Indices

CATEGORY	S&P 500 GARP INDEX	S&P 500 GROWTH	S&P 500 ENHANCED VALUE INDEX	S&P 500 QUALITY INDEX	S&P 500
Average Return (Annualized, %)	13.28	10.41	11.83	12.69	9.81
Standard Deviation (Annualized, %)	17.79	15.34	18.57	13.68	14.75
Return/Risk	0.75	0.68	0.64	0.93	0.67

Source: S&P Dow Jones Indices LLC. Data from June 30, 1995, to May 31, 2019. Index performance based on total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

With the S&P 500 as the underlying benchmark, we can use the information ratio (IR)[6] to evaluate whether a strategy is able to add value for each incremental unit of active risk taken (see Exhibit 6).

We can use the IR to evaluate whether a strategy is able to add value for each incremental unit of active risk taken.

Exhibit 6: Excess Return and IR Comparison of S&P 500 GARP Index with Other S&P Factor Indices

CATEGORY	S&P 500 GARP INDEX	S&P 500 GROWTH	S&P 500 ENHANCED VALUE INDEX	S&P 500 QUALITY INDEX
Average Excess Return (Annualized, %)	3.46	0.60	2.02	2.88
Standard Deviation (Annualized)	7.32	4.08	9.48	4.96
IR	0.47	0.15	0.21	0.58

Source: S&P Dow Jones Indices LLC. Data from June 30, 1995, to May 31, 2019. Index performance based on total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

As seen in Exhibit 6, the S&P 500 GARP Index had a positive IR of 0.47 over the long-term investment horizon, which was higher than the S&P 500 Growth (0.15) and S&P 500 Enhanced Value Index (0.21), but it had a lower IR than the S&P 500 Quality Index (0.58).

The GARP strategy had a higher IR (0.47) than the growth (0.15) and enhanced value indices (0.21).

TARGETED FACTOR EXPOSURES

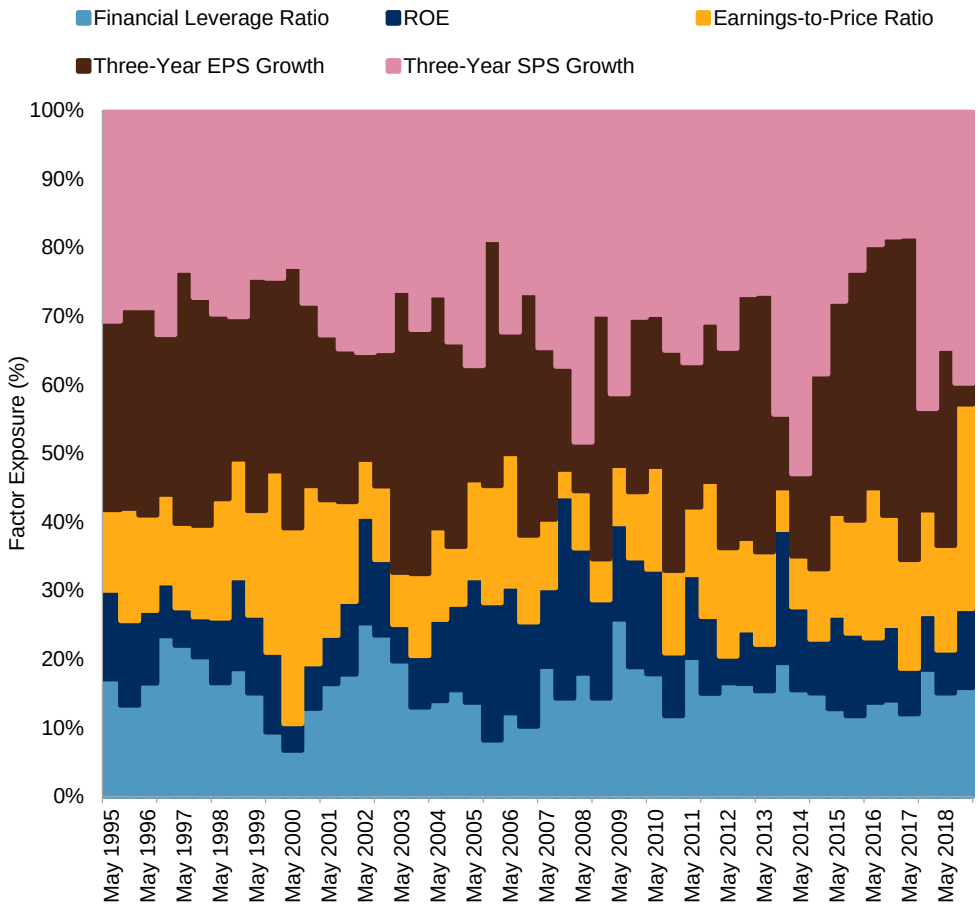
Exhibit 7 shows the active exposures (in percentages) of the S&P 500 GARP Index to the five fundamental metrics used in GARP strategies: three-year SPS growth, three-year EPS growth, earnings-to-price ratio, ROE, and financial leverage ratio.

We define active exposure as the portfolio factor exposure minus the benchmark factor exposure, and we define factor percentage exposure as the active exposure of one factor divided by the sum of all five factors. We then take the monthly average of all the periods to represent the average active exposure. In Exhibit 7, we see that SPS growth and EPS growth had exposure levels that dominated the factor exposures, with 31% and 27%, respectively. The earnings-to-price ratio, ROE, and financial leverage ratio had exposures of 14%, 11%, and 16%, respectively. The factor exposure levels in the first layer of filters doubled that of the second layer of filters. The exposure results show that the multi-factor sequential filtering approach achieved its designed goal.

[6] Information ratio definition is shown in Appendix C.

Active factor exposure analysis shows that the sequential filtering approach achieved its designed goal.

Exhibit 7: Active Factor Exposure of the S&P 500 GARP Index



The active weight of the S&P 500 GARP Index has been no more than 7%.

Source: S&P Dow Jones Indices LLC. Data from June 30, 1995, to May 31, 2019. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this paper for more information regarding the inherent limitations associated with back-tested performance.

SECTOR COMPOSITION

In order to reduce concentration risk, we limit the maximum weight of each sector to 40%. As shown in Exhibit 8, historically the active weight[7] of the S&P 500 GARP Index has been no more than 7%.

[7] Active weight is defined as the portfolio sector weight minus the benchmark sector weight.

Exhibit 8: GARP Strategy Monthly Average of Sector Composition

SECTOR	S&P 500 GARP INDEX (%)	S&P 500 (%)	ACTIVE WEIGHT (%)
Communication Services	0.72	4.29	-3.57
Consumer Discretionary	18.58	11.78	6.80
Consumer Staples	4.21	10.15	-5.94
Energy	12.09	8.70	3.39
Financials	10.94	16.54	-5.60
Health Care	12.29	12.82	-0.53
Industrials	11.11	10.53	0.58
Information Technology	20.71	18.04	2.67
Materials	6.25	3.39	2.85
Real Estate	0.20	0.32	-0.12
Utilities	2.62	3.31	-0.69
Unassigned	0.29	0.13	0.15

Source: S&P Dow Jones Indices LLC. Data from June 30, 1995, to May 31, 2019. Index performance based on total return in USD. Attribution analysis is done with FactSet Portfolio Analysis 3.0. 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.

PERFORMANCE ATTRIBUTION

Performance attribution shows that the GARP strategy outperformance has mainly come from stock selection rather than sector allocation.

Using the S&P 500 as the benchmark, we analyze the GARP strategy's sources of excess returns over the back-tested period. Grouping by sectors, we look at the sector allocation[8] and individual stock selection effects (see Exhibit 9).

Performance attribution shows that individual stock selection contributed to 73% of active returns, while sector allocation contributed to 27%. It thus shows that the GARP strategy outperformance has mainly come from stock selection rather than sector allocation.

[8] Sector allocation effect is the portion of portfolio excess return attributed to taking on sector bets in comparison with the benchmark. Individual stock selection effect is the portion of portfolio excess return attributable to individual stock selection when the sector weight is the same as that in the benchmark.

Exhibit 9: GARP Strategy Monthly Average of Performance Attribution

SECTOR	ALLOCATION EFFECT (%)	SELECTION EFFECT (%)	TOTAL EFFECT (%)
Communication Services	0.15	0.04	0.19
Consumer Discretionary	0.17	0.16	0.33
Consumer Staples	0.02	0.04	0.05
Energy	0.23	0.37	0.60
Financials	-0.11	0.13	0.02
Health Care	-0.08	0.77	0.69
Industrials	-0.01	-0.30	-0.31
Information Technology	0.58	0.71	1.29
Materials	-0.03	0.32	0.29
Real Estate	0.00	-0.00	-0.01
Utilities	0.07	0.27	0.34
Unassigned	-0.04	-0.02	-0.06
Total	**1.03**	**2.80**	**3.83**

Source: S&P Dow Jones Indices LLC. Data from June 30, 1995, to May 31, 2019. Index performance based on total return in USD. Attribution analysis is done with FactSet Portfolio Analysis 3.0. 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

The S&P 500 GARP Index seeks to balance pure growth and pure valuation.

Aiming to balance pure growth and pure valuation exposures, the S&P 500 GARP Index uses a multi-factor sequentially filtering stock selection process. The back-tested results show that the strategy had better long-term risk-adjusted returns than the S&P 500 and other single factor indices, with the exception of the S&P 500 Quality Index. Moreover, factor exposure analysis shows that the multi-factor sequential filtering approach has achieved its objective of targeted factor exposure level. Performance attribution reveals that selection effect (versus allocation effect) has dominated the sources of excess return of the S&P 500 GARP Index over the S&P 500.

APPENDIX A

Fundamental Ratios Calculation

As of the rebalancing reference date, fundamental ratios were calculated for each security in the index universe. They are defined as follows.

- **Three-Year EPS Growth:** This is calculated as a company's three-year EPS compound annual growth rate (CAGR).
- **Three-Year SPS Growth:** This is calculated as a company's three-year SPS CAGR.
- **ROE:** This is calculated as a company's trailing 12-month EPS divided by its latest book value per share (BVPS).

$$\text{ROE} = \frac{\text{EPS}}{\text{BVPS}}$$

- **Financial Leverage Ratio:** This is calculated as a company's latest total debt divided by its BVPS.

$$\text{Financial Leverage Ratio} = \frac{\text{Total Debt}}{\text{BVPS x Common Shares Outstanding}}$$

- **Earnings-to-Price Ratio:** This is calculated as a company's trailing 12-month EPS divided by its price.

$$\text{Earnings to Price} = \frac{\text{EPS}}{\text{Price}}$$

Outlier Handling and Winsorization: Outlier fundamental ratios are winsorized to ensure that the average values used to calculate the overall component score are less distorted by extreme values. For a given fundamental variable, the values for all securities are first ranked in ascending order. Then, for securities that lie above the 97.5 percentile rank or below the 2.5 percentile rank, their value is set as equal to the value of the 97.5 percentile ranked or the 2.5 percentile ranked security, whichever is applicable.

- **ROE**. If the underlying data points for a given stock's ROE are both negative, leading to a positive ROE, its ROE value will be excluded and the stock will be assigned an ROE z-score set as equal to the ROE z-score value of the 2.5 percentile ranked security.
- **Financial Leverage Ratio**. If the underlying data point for a given stock's BVPS is negative, leading to a negative leverage, its leverage value will be excluded and the stock will be assigned a leverage z-score set as equal to the leverage z-score value of the 2.5 percentile ranked security.

APPENDIX B

Z-Score and Growth Score Computation

Z-Score Computation: Computing a z-score is a widely adopted method of standardizing a variable in order to combine it with other variables that may have a different scale or unit of measurement. After winsorizing all the fundamental ratios, the z-score for each of the ratios for each security is calculated using the mean and standard deviation of the relevant variable within each of the index universes.

The z-score is calculated as follows.

$$z_\alpha=(x_\alpha-\mu_\alpha)/\sigma_\alpha$$

Financial Leverage Ratios: The z-score is calculated as follows.

$$z_\alpha= -(x_\alpha-\mu_\alpha)/\sigma_\alpha$$

where:

- z_α = Z-score for a given security
- x_α = Winsorized variable for a given security
- μ_α = Arithmetic mean of the winsorized variable in a given index universe, excluding any missing values
- σ_α = Standard deviation of the winsorized variable in a given index universe

Average Z-score Computation: For each security, the average z-score is computed by taking a simple average of the relevant scores. Where there is a missing value, the average z-score is computed by taking a simple average of the remaining scores. A security must have at least one z-score for it to be included in the index.

Outlier Handling and Winsorization: Outlier average z-scores are winsorized to ensure that the overall growth scores are less distorted by extreme values. To do this, for a given average z-score, the values for all securities are first ranked in ascending order. Then, for securities that lie above 4 or below -4, their value is set as equal to 4 or -4, whichever is applicable.

Growth Score Computation: Using the winsorized growth z-score, a growth score is computed for each of the securities. For a given security, if its winsorized growth z-score is above 0, then its growth score will be the addition of 1 and the winsorized growth z-score. On the other hand, if its winsorized growth z-score is below 0, then its growth score will be the result of the reciprocal of 1 subtracted by its winsorized growth z-score.

If average $\mathrm{Z} > 0$, $\mathrm{Growth\ Score} = 1 + \mathrm{Z}$.
If average $\mathrm{Z} < 0$, $\mathrm{Growth\ Score} = (1/(1-\mathrm{Z}))$.
If average $\mathrm{Z} = 0$, $\mathrm{Growth\ Score} = 1$.

APPENDIX C

Buffer Rule

A 20% buffer is applied to stocks already in the index in order to reduce portfolio turnover and is implemented as follows.

1.1 Stocks in the top 150, based on their growth z-score, are ranked by QV composite z-score. The top 60 stocks are automatically chosen for index inclusion.

1.2 Stocks that are current constituents that fall within the top 90 by QV composite z-score are chosen for index inclusion in order of their QV composite z-score.

1.3 If at this point 75 stocks have not been selected, the remaining stocks are chosen based on their QV composite z-score until the target count is reached.

Information Ratio Definition

Information ratio (IR) is defined as below,

Where the tracking error is defined as the standard deviation of the difference between the strategy and benchmark returns.

$$\text{IR} = \frac{\text{Strategy Return} - \text{Benchmark Return}}{\text{Tracking Error}}$$

PERFORMANCE DISCLOSURE

The S&P 500 GARP Index was launched February 25, 2019. The S&P 500 Enhanced Value Index was launched April 27, 2015. The S&P 500 Quality Index was launched July 8, 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. However, when creating back-tested history for periods of market anomalies or other periods that do not reflect the general current market environment, index methodology rules may be relaxed to capture a large enough universe of securities to simulate the target market the index is designed to measure or strategy the index is designed to capture. For example, market capitalization and liquidity thresholds may be reduced. Complete index methodology details are available at www.spdji.com. Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown.

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

The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at www.spdji.com 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