S&P Dow Jones Indices

A Division of S&P Global

S&P QVML Multi-Factor Indices
Methodology

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Introduction

Index Objective and Highlights

The S&P 500 QVML Multi-Factor Index measures the performance of stocks from the S&P 500 (the "Index Universe") having the highest combination of quality, value, momentum, and low volatility, as measured by a multi-factor score. Index constituents are weighted by the product of their market capitalization and a multi-factor score, subject to constraints on single stock and sector weights, as described in *Constituent Weightings*.

Please refer to *Index Construction* for details on score calculation.

Supporting Documents

This methodology is meant to be read in conjunction with supporting documents providing greater detail with respect to the policies, procedures and calculations described herein. References throughout the methodology direct the reader to the relevant supporting document for further information on a specific topic. The list of the main supplemental documents for this methodology and the hyperlinks to those documents is as follows:

Supporting Document	URL
S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology	Equity Indices Policies & Practices
S&P Dow Jones Indices' Index Mathematics Methodology	Index Mathematics Methodology
S&P Dow Jones Indices' Float Adjustment Methodology	Float Adjustment Methodology
S&P Dow Jones Indices' Global Industry Classification Standard (GICS) Methodology	GICS Methodology

This methodology was created by S&P Dow Jones Indices to achieve the aforementioned objective of measuring the underlying interest of each index governed by this methodology document. Any changes to or deviations from this methodology are made in the sole judgment and discretion of S&P Dow Jones Indices so that the index continues to achieve its objective.

Eligibility Criteria

Index Universe

The index universe is the S&P 500. To be eligible for consideration, a stock must be an existing member of the index universe as of the rebalancing reference date.

Eligibility Factor

Data Availability. A stock is ineligible if it is missing any of the data required for the computation of one of the underlying quality, value, momentum, and low volatility scores.

Multiple Share Classes. Each company is represented once by the Designated Listing. For more information regarding the treatment of multiple share classes, please refer to Approach B within the Multiple Share Classes section of the S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology.

Index Construction

Constituent Selection

The selection of index constituents is as follows:

1. Calculate quality, value, momentum, and low volatility z-scores for each eligible stock.

   For more information on the calculation of the quality and value z-scores, please refer to the S&P Quality Indices and S&P Enhanced Value Indices Methodologies, respectively, available at www.spglobal.com/spdji.

   For more information on the calculation of the momentum and low volatility z-scores, please refer to Appendix A and Appendix B, respectively.

2. For each set of z-scores (quality, value, momentum, and low volatility), percentile scores are calculated as follows:[1]

   $$P_i = \frac{R_i}{N+1}$$

   where:

   P_i = Constituent percentile score

   R_i = Constituent fractional rank

   N = Number of constituents

   Note that higher ranking constituents (R_i) are the constituents with stronger underlying z-scores, and are given higher percentile scores.

3. Each set of percentile scores are then transformed into a new set of z-scores (Z') using the inverse of the normal cumulative distribution function with a mean of zero and a standard deviation of 1.

4. An average multi-factor z-score ($x_{i_{MF}}$) is calculated for each constituent by taking the average of the underlying quality, value, momentum, and low volatility z-scores which have been derived from the percentile scores.

   $$x_{i_{MF}} = (Z'_{i_Q} + Z'_{i_V} + Z'_{i_M} + Z'_{i_{LV}})/4$$

   where:

   $x_{i_{MF}}$ = Constituent average multi-factor z-score

   Z'_{i_Q} = Constituent quality Z-score

   Z'_{i_V} = Constituent value Z-score

   Z'_{i_M} = Constituent momentum Z-score

   $Z'_{i_{LV}}$ = Constituent low volatility Z-score

[1] Note that the quality and value z-scores used in calculating percentiles are average z-scores (i.e. non-winsorized) according to the *S&P Quality Indices* and *S&P Enhanced Value Indices Methodologies,* respectively. With respect to Momentum and Low Volatility, z-scores are not based on an average as these scores are derived from one underlying factor. The momentum Z-score and low volatility Z-score are non-winsorized.

The multi-factor z-score $Z'_{i_{MF}}$ is calculated by standardizing the average multi-factor z-score $x_{i_{MF}}$ using the mean and standard deviation of $x_{i_{MF}}$

$$Z'_{i_{MF}} = \frac{(x_{i_{MF}} - \mu_{i_{MF}})}{\sigma_{i_{MF}}}$$

where:

$Z'_{i_{MF}}$ = Constituent multi-factor z-score for a given security

$x_{i_{MF}}$ = Constituent average multi-factor z-score for a given security

$\mu_{i_{MF}}$ = Arithmetic mean of the constituent average multi-factor z-score, excluding any missing values

$\sigma_{i_{MF}}$ = Standard deviation of the constituent average multi-factor z-score

5. Finally, a multi-factor score (S_i) is calculated as follows:

   If $Z'_{i_{MF}} > 0$, $\boldsymbol{S_i} = \mathbf{1} + Z'_{i_{MF}}$

   If $Z'_{i_{MF}} < 0$, $\boldsymbol{S_i} = \mathbf{1}/(\mathbf{1} - Z'_{i_{MF}})$

   If $Z'_{i_{MF}} = 0$, $\boldsymbol{S_i} = \mathbf{1}$

6. Eligible stocks are ranked based on the multi-factor score (S_i) and then the top ranked 100 stocks are selected as index constituents, subject to a 20% buffer.[2]

Buffer Rule

A 20% buffer is applied to stocks already in the index and is implemented as follows:

1. Stocks ranked, by multi-factor score, within the top 80% of the target stock count are automatically chosen for index inclusion.
2. Current constituents within the top 120% of the target stock count are chosen for index inclusion in order of their multi-factor score.
3. If at this point the target stock count has still not been met, the highest ranked non-constituents are selected until the target count is met.

Constituent Weightings

At each rebalancing, constituents are weighted by the product of their market capitalization in the underlying index universe and their multi-factor score, subject to security and sector constraints.

The final constituent weight is determined through the use of an optimization procedure such that:

- The maximum weight of each security is the lower of 5% and 20 times its market capitalization weight in the underlying index universe.
- The maximum weight of any given GICS sector is 40%.
- Each stock's weight is floored at 0.05%.

Note that the capping algorithm used redistributes any excess weight to the other stocks in proportion to their multi-factor weights (pre-optimization weights).

[2] When two stocks have an equal multi-factor score, the one with a larger market capitalization is ranked higher for constituent selection purposes.

Where the optimization procedure fails for a period, the constraints are relaxed in the following order:

- the maximum weight of the security
- the maximum weight of the sector

In the event that the optimization procedure still fails for a period, then the maximum weight constraint is ignored.

Index Calculations

The index is calculated by means of the divisor methodology used in most S&P Dow Jones Indices equity indices.

For more information on the index calculation methodology, please refer to the Non-Market Capitalization Weighted Indices section of S&P Dow Jones Indices' Index Mathematics Methodology.

Index Maintenance

Rebalancing

The index rebalances semi-annually, effective after the close on the third Friday of June and December. The fundamental data reference dates are five weeks prior to each rebalancing date. As part of the rebalancing process, constituent stock weights are updated. Weights calculated as a result of the reference date data are implemented in the index using closing prices as of the Wednesday prior to the second Friday of June and December.

Additions. Except for spin-offs, no additions are made to the index between the semi-annual rebalancings.

Deletions. Index constituents removed from the underlying index are removed from the index simultaneously.

Corporate Actions

Corporate Action	Adjustment Made to the Index	Divisor Adjustment?
Spin-offs	Spin-offs are ineligible to remain in the index. Spin-offs are added to the index at a zero price at the market close of the day before the ex-date and removed after at least one day of regular way trading.	

For more information on other corporate actions, please refer to the Non-Market Capitalization Indices section of S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology.

Currency of Calculation and Additional Index Return Series

The index calculates in U.S. dollars.

WM/Refinitiv foreign exchange rates are taken daily at 4:00 PM London time and used in the calculation of the indices. These mid-market fixings are calculated by the WM Company based on Refinitiv data and appear on Refinitiv pages WMRA.

In addition to the indices detailed in this methodology, additional return series versions of the indices may be available, including, but not limited to the following: currency, currency hedged, decrement, fair value, inverse, leveraged, and risk control versions. For a list of available indices, please refer to the *S&P DJI Methodology & Regulatory Status Database*.

For information on the index calculation, please refer to S&P Dow Jones Indices' Index Mathematics Methodology.

For the inputs necessary to calculate certain types of indices, including decrement, dynamic hedged, fair value, and risk control indices, please refer to the Parameters documents available at www.spglobal.com/spdji.

Base Date and History Availability

The index history availability, base dates, and base values are shown in the table below.

Index	Launch Date	First Value Date	Base Date	Base Value
S&P 500 QVML Multi-Factor Index	08/10/2020	06/16/1995	06/16/1995	100

Index Data

Calculation Return Types

S&P Dow Jones Indices calculates multiple return types which vary based on the treatment of regular cash dividends. The classification of regular cash dividends is determined by S&P Dow Jones Indices.

- Price Return (PR) versions are calculated without adjustments for regular cash dividends.
- Gross Total Return (TR) versions reinvest regular cash dividends at the close on the ex-date without consideration for withholding taxes.
- Net Total Return (NTR) versions, if available, reinvest regular cash dividends at the close on the ex-date after the deduction of applicable withholding taxes.

In the event there are no regular cash dividends on the ex-date, the daily performance of all three indices will be identical.

For a complete list of indices available, please refer to the daily index levels file (".SDL").

For more information on the classification of regular versus special cash dividends as well as the tax rates used in the calculation of net return, please refer to S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology.

For more information on the calculation of return types, please refer to S&P Dow Jones Indices' Index Mathematics Methodology.

Index Governance

Index Committee

An S&P Dow Jones Indices Index Committee maintains the index. All committee members are full-time professional members of S&P Dow Jones Indices' staff. The Committee meets regularly. At each meeting, the Committee reviews pending corporate actions that may affect index constituents, statistics comparing the composition of the indices to the market, companies that are being considered as candidates for addition to the indices, and any significant market events. In addition, the Index Committee may revise index policy covering rules for selecting companies, treatment of dividends, share counts or other matters.

S&P Dow Jones Indices considers information about changes to its indices and related matters to be potentially market moving and material. Therefore, all Index Committee discussions are confidential.

S&P Dow Jones Indices' Index Committees reserve the right to make exceptions when applying the methodology if the need arises. In any scenario where the treatment differs from the general rules stated in this document or supplemental documents, clients will receive sufficient notice, whenever possible.

In addition to the daily governance of indices and maintenance of index methodologies, at least once within any 12-month period, the Index Committee reviews the methodology to ensure the indices continue to achieve the stated objectives, and that the data and methodology remain effective. In certain instances, S&P Dow Jones Indices may publish a consultation inviting comments from external parties.

For information on Quality Assurance and Internal Reviews of Methodology, please refer to S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology.

Index Policy

Announcements

All index constituents are evaluated daily for data needed to calculate index levels and returns. All events affecting the daily index calculation are typically announced in advance via the Index Corporate Events report (.SDE), delivered daily to all clients. Any unusual treatment of a corporate action or short notice of an event may be communicated via email to clients.

For more information, please refer to the Announcements section of S&P Dow Jones Indices' Equity Indices Policies & Practices document.

Pro-forma Files

In addition to the corporate events file (.SDE), S&P Dow Jones Indices provides constituent pro-forma files each time the index rebalances. The pro-forma file is typically provided daily in advance of the rebalancing date and contains all constituents as well as their corresponding weights and index shares effective for the upcoming rebalancing. Since index shares are assigned based on prices prior to the rebalancing, the actual weight of each stock at the rebalancing differs from these weights due to market movements.

Please visit www.spglobal.com/spdji for a complete schedule of rebalancing timelines and pro-forma delivery times.

Holiday Schedule

The indices are calculated daily, throughout the calendar year, when the U.S. equity markets are open.

A complete holiday schedule for the year is available on S&P Dow Jones Indices' Web site at www.spglobal.com/spdji.

Rebalancing

The Index Committee may change the date of a given rebalancing for reasons including market holidays occurring on or around the scheduled rebalancing date. Any such change will be announced with proper advance notice where possible.

Unexpected Exchange Closures

For information on Unexpected Exchange Closures, please refer to S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology.

Recalculation Policy

For information on the recalculation policy, please refer to S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology.

Real-Time Calculation

Real-time, intra-day, index calculations are executed for some versions of the index, whenever the index's primary exchanges are open. Real-time indices are not restated.

For information on Calculations and Pricing Disruptions, Expert Judgment and Data Hierarchy, please refer to S&P Dow Jones Indices' Equity Indices Policies & Practices document.

Contact Information

For questions regarding an index, please contact: index_services@spglobal.com.

Index Dissemination

Index levels are available through S&P Dow Jones Indices' Web site at *www.spglobal.com/spdji*, major quote vendors (see codes below), numerous investment-oriented Web sites, and various print and electronic media.

Tickers

The table below lists headline indices covered by this document. All versions of the below indices that may exist are also covered by this document. Please refer to the *S&P DJI Methodology & Regulatory Status Database* for a complete list of indices covered by this document.

Index	Return Type	Bloomberg	RIC
S&P 500 QVML Multi-Factor Index (USD)	Price Return	SPXQLMUP	.SPXQLMUP
	Total Return	SPXQLMUT	.SPXQLMUT
	Net Total Return	SPXQLMUN	.SPXQLMUN

Index Data

Daily constituent and index level data are available via subscription.

For product information, please contact S&P Dow Jones Indices, www.spglobal.com/spdji/en/contact-us.

Web Site

For further information, please refer to S&P Dow Jones Indices' Web site at www.spglobal.com/spdji.

Appendix A

Momentum Z-Score Calculation

1. **Momentum Value Calculation.** Momentum value is calculated for each of the securities in the index universe on each of the rebalancing reference dates. The momentum value is computed as the 12-month price change, excluding the most recent month of the security in local currency. If 12 months of price history is not available, momentum value is calculated from nine months of price history. The effective rebalancing month is stated as month (*M*).

   a. Momentum Value $= \left(price_{M-2} \Big/ price_{M-14} \right) - 1$

   or,

   b. Momentum Value $= \left(price_{M-2} \Big/ price_{M-11} \right) - 1$ if 12 months of price history is not available.

2. **Momentum Z-Score Computation.** Computing a z-score is a widely adopted method of standardizing a variable. The z-score for each security is calculated using the mean and standard deviation of the relevant variable within each of the index universes. The momentum z-score is calculated as follows:

$$Z_{i_M} = \frac{(x_{i_M} - \mu_M)}{\sigma_M}$$

where:

Z_{i_M} = Momentum Z-score for a given security i

x_{i_M} = Observed momentum value for a given security i

μ_M = Arithmetic mean of the variable in a given index universe, excluding any missing values

σ_M = Standard deviation of the variable in a given index universe

Appendix B

Low Volatility Z-Score Calculation

1. **Volatility Value Calculation.** Volatility is defined as the standard deviation of the security's daily price returns, in local currency, over the prior one year of trading days. It can be mathematically expressed as:

$$\sqrt{\frac{\sum_{t=1}^{N}(X_t - \bar{X})^2}{N-1}}$$

where:

X_t = Price change = $P_t/P_{t-1} - 1$

P_t = Closing price of the stock on day t

P_{t-1} = Closing price of the stock on day $t-1$

t = 1 to N

$\bar{X}$ = Average price change

N = Number of trading days in a year based on local calendar

2. **Low Volatility Z-Score Computation.** The low volatility z-score for each security is calculated based on the inverse of its volatility as follows:

$$Z_{i_{LV}} = \frac{(x_{i_{LV}} - \mu_{LV})}{\sigma_{LV}}$$

where:

$Z_{i_{LV}}$ = Low Volatility Z-score for a given security i

$x_{i_{LV}}$ = $\frac{1}{Volatility_i}$ for a given security i

μ_{LV} = Arithmetic mean of $\frac{1}{Volatility_i}$ in a given index universe, excluding any missing values

σ_{LV} = Standard deviation of $\frac{1}{Volatility_i}$ in a given index universe

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