

S&P Dow Jones Indices

A Division of **S&P Global**

S&P MAESTRO 5 Index *Methodology*

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Introduction

Index Objective

The S&P MAESTRO 5 Index (Multi-Asset Equal Risk Factor Contribution) is a weighted return index that measures the performance of a multi-asset risk parity strategy. The index allocates risk equally among seven equity, fixed income, and commodities component indices.

Highlights

The base Equal Risk Contribution (ERC) index follows a quantitative methodology to achieve an equal risk exposure to each component index and is designed as a leveraged index to target a 5% level of volatility. The maximum leverage is capped at 150%.

A VIX overlay is applied to the base ERC index, consisting of a 2% monthly allocation to the S&P 500 VIX Mid-Term Futures ER and a dynamic 5% daily allocation to the S&P 500 VIX Short-Term Futures ER, based on a Curvature signal defined in *Eligibility Criteria and Construction*.

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' Commodities Indices Policies & Practices Methodology	Commodities Indices Policies & Practices
S&P Dow Jones Indices' Fixed Income Policies & Practices Methodology	Fixed Income Policies & Practices
S&P Dow Jones Indices' Index Mathematics Methodology	Index Mathematics Methodology
S&P Dow Jones Indices' Fixed Income Index Mathematics Methodology	Index Mathematics Methodology

Eligibility Criteria and Index Construction

Index Universe

The following indices form the base ERC index universe:

Index	Return Type	Ticker	Asset Class
S&P 500 Quality	Excess Return*	--	Equity
S&P 500 Momentum	Excess Return*	--	Equity
S&P 500 Low Volatility	Excess Return*	--	Equity
S&P 500 High Dividend	Excess Return*	--	Equity
S&P GSCI Gold	Excess Return	SPGSGCP	Commodity
S&P 5-Year U.S. Treasury Note Futures	Excess Return	SPUST5P	Fixed Income
S&P 10-Year U.S. Treasury Note Futures	Excess Return	SPUSTTP	Fixed Income

The following indices form the VIX Overlay:

Index	Return Type	Ticker	Asset Class
S&P 500 VIX Mid-Term Futures Index	Excess Return	SPVXMP	Volatility
S&P 500 VIX Short-Term Futures Index	Excess Return	SPVXSP	Volatility

* For purposes of the S&P MAESTRO 5 Index, an excess return version of the list of equity indices is calculated from the total return versions of each index, as follows:

Index	Return Type	Ticker	Asset Class
S&P 500 Quality	Total Return	SPXQUT	Equity
S&P 500 Momentum	Total Return	SP500MUT	Equity
S&P 500 Low Volatility	Total Return	SP5LVIT	Equity
S&P 500 High Dividend	Total Return	SPXHDUT	Equity

$$Excess\ Return_t = \left(\frac{Total\ Return\ Index_t}{Total\ Return\ Index_{t-1}} - 1 \right) - \left(InterestRate_{t-1} * \frac{NumDays_t}{360} \right)$$

$$Excess\ Return\ Index_t = Excess\ Return\ Index_{t-1} * (1 + Excess\ Return_t)$$

where:

$InterestRate_{t-1}$ = Effective Federal Funds Rate. A 360-day year is assumed for the interest calculations in accordance with U.S. banking practices.

$NumDays_t$ = The number of calendar days between day $t-1$ and day t .

Weighting Scheme

On each reference date, to construct the base ERC index, the seven component indices' weights are optimized with the objective of setting an equal risk contribution between the component indices. To achieve the desired weighting scheme, for a given portfolio with weights $w = (w_1, \dots, w_7)$ and total volatility $\sigma(w)$, an optimizer is used to find the optimal weights w' so that the difference of the marginal risk contribution of each component is minimized.

The marginal risk contribution of the i^{th} component index to the base ERC index is defined as:

$$mc_i(w) = w_i * \frac{\text{cov}(\sigma_i, \sigma(w))}{\sigma(w)}$$

where:

w_i = the weight of the i^{th} component index

$\text{cov}(\sigma_i, \sigma(w))$ = the covariance of the i^{th} component index and the base ERC index

where:

$\sigma(w) = \sqrt{w^T \Sigma w}$ is the base ERC index volatility

Σ = the covariance matrix of component index returns, exponentially weighted with decay λ and calculated with a 60-day rolling window

$\lambda = 0.94$

The optimized weights are obtained after solving the following optimization problem:

$$w' = \arg \min f(w)$$

under constraints:

$$\sum_{i=1}^7 w_i = 1$$

$0 \leq w_i \leq 1$ for each i

where:

$$f(w) = \sum_{i=1}^n \sum_{j=1}^n (mc_i(w) - mc_j(w))^2$$

VIX Overlay

The VIX Overlay consists of the following two components:

- A 5% dynamic allocation to the S&P 500 VIX Short-Term Futures index that resets daily and is conditional on the *Curvature* signal described below.
- A 2% allocation to the S&P 500 VIX Mid-Term Futures index rebalanced on a monthly basis, effective on the second trading day.

The remaining weight is allocated to the base ERC index in order to sum 100%.

The dynamic allocation to the S&P 500 VIX Short-Term Futures index is triggered if the *Curvature* signal fulfills the requirements described below:

- If *Curvature* ≥ 0 (concave), there is no allocation to the S&P 500 VIX Short-Term Futures index.
- If *Curvature* < 0 (convex), there is a 5% allocation to the S&P 500 VIX Short-Term Futures index that is rebalanced daily.

The *Curvature* is defined as:

$$\text{Curvature}_t = \frac{UX2_t - UX1_t}{UX2_t} - \frac{1}{3} * \frac{UX7_t - UX4_t}{UX7_t}$$

where:

UXk_t = the k -month VIX futures closing price on day t .

The dynamic allocation to the S&P 500 VIX Short-Term Futures index switches when the *Curvature* signal changes and remains for two trading days. The 5% dynamic allocation can remain up to 30 trading days, and becomes effective on the second trading day. When the curvature signal is concave, or after 30 trading days of dynamic allocation to the S&P 500 VIX Short-Term Futures, the index only allocates to the base ERC index and the S&P 500 VIX Mid-Term Futures and becomes effective on the second trading day.

See *Index Maintenance* for specific allocation schedules for the VIX Overlay.

Daily Leverage Calculation for the Base ERC Index

Each day, the leverage is the minimum between 150% and the ratio of the annualized target volatility to the previous 60-day exponentially weighted annualized volatility. For the calculation of the 60-day annualized volatility, sum the product of the weights and the returns of each component index for the lookback period, calculated as follows:

$$\text{Base ERC Index Return}_{t-n} = \sum_{i=1}^7 w_t^i * \text{Component index return}_{t-n}^i$$

where:

- w_t^i = the weight of the component index i in date t
- return_{t-n}^i = daily return of component index i in date $t - n$
- t = the analysis date
- n = {0,59}

Then, the exponentially weighted annualized volatility is calculated as follows:

$$\sigma_t = \sqrt{252 * \sum_{n=0}^{59} \frac{(1 - \lambda) * \lambda^n * (\text{Base ERC Index Return}_{t-n} - \mu_t)^2}{1 - \lambda^{60}}}$$

where:

- μ_t = the average of the base ERC index returns on date t
- λ = 0.94

The leverage is calculated as below:

$$\text{Leverage}_{t-2} = \min \left(\frac{\text{Annualized target volatility}}{\sigma_{t-2}}, \text{Maximum leverage} \right)$$

where:

- Annualized target volatility = 5%
- Maximum leverage = 150%

Index Level Calculations

On a given business day t , the base ERC index excess return (ER) is equal to:

$$\text{Base ERC Excess Return}_t = \text{Leverage}_{t-2} * \sum_{i=1}^7 w_{t-2}^i * \text{return}_t^i$$

After including the VIX Overlay, the index excess return (ER) and total return (TR) are equal to:

$$Excess\ Return_t = (1 - w_{t-2}^{ST} * S_{t-2} - w_{t-2}^{MT}) * Base\ ERC\ ER_t + w_{t-2}^{ST} * S_{t-2} * return_t^{ST} + w_{t-2}^{MT} * return_t^{MT}$$

$$Total\ Return_t = Excess\ Return_t + \left(InterestRate_{t-1} * \frac{NumDays_t}{360} \right)$$

where:

w_{t-2}^{ST} = the allocation to the S&P 500 VIX Short-Term Futures on day $t - 2$

w_{t-2}^{MT} = the allocation to the S&P 500 VIX Mid-Term Futures on day $t - 2$

$return_t^{ST}$ = the index return of the S&P 500 VIX Short-Term Futures on day t

$return_t^{MT}$ = the index return of the S&P 500 VIX Mid-Term Futures on day t

$Base\ ERC\ ER_t$ = the index excess return of the Base ERC index on day t

$S_{t-2} = \{0, 1\}$ = the curvature signal that indicates whether to allocate w_{t-2}^{ST} to the S&P 500 VIX Short-Term Futures

$InterestRate_{t-1}$ = Effective Federal Funds Rate. A 360-day year is assumed for the interest calculations in accordance with U.S. banking practices

$NumDays_t$ = The number of calendar days between day $t-1$ and day t

On a given business day t , the index level in excess return (ER) and total return (TR) are equal to:

$$Index\ ER_t = Index\ ER_{t-1} * (1 + Excess\ Return_t)$$

$$Index\ TR_t = Index\ TR_{t-1} * (1 + Total\ Return_t)$$

Index Maintenance

Rebalancing

Base ERC index optimized weights are calculated after the close of the last business day of each month (the reference date) and become effective on the second trading day of the next month (the rebalancing date).

Leverage is calculated daily and becomes effective on the second trading day.

The 2% allocation to the S&P 500 VIX Mid-Term Futures is reset on a monthly basis and becomes effective on the second trading day of the next month (the rebalancing date). The dynamic allocation to the S&P 500 VIX Short-Term Futures is calculated daily and becomes effective on the second trading day.

Currency of Calculation and Additional Index Return Series

The index calculates in U.S. dollars.

In addition to the indices detailed in this methodology, additional return series versions of the indices may be available, including, but not limited to: 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 various index calculations, 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.spdji.com.

Base Date and History Availability

Index history availability, base date, and base value are shown in the table below.

Index	Launch Date	First Value Date	Base Date	Base Value
S&P MAESTRO 5 Index	02/22/2021	01/03/2006	01/03/2006	100

Index Governance

Index Committee

Each of S&P Dow Jones Indices' indices is the responsibility of an Index Committee that monitors overall policy guidelines and methodologies, as well as additions to and deletions from these indices.

Decisions made by the Index Committee include all matters relating to index construction and maintenance. The Index Committee meets regularly to review market developments and convenes as needed to address major corporate actions.

It is the sole responsibility of the Index Committee to decide on all matters relating to methodology, maintenance, constituent selection and index procedures. The Index Committee makes decisions based on all publicly available information and discussions are kept confidential to avoid any unnecessary impact on market trading.

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

Holiday Schedule

The index calculates when the U.S. equity markets are open.

A complete holiday schedule for the year is available at www.spdji.com.

Unexpected Exchange Closures

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

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.

Recalculation Policy

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

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

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.spdji.com, 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 [S&P DJI Methodology & Regulatory Status Database](#) for a complete list of indices covered by this document.

Index	Return Type	Bloomberg
S&P MAESTRO 5 (USD)	Excess Return Total Return	SPMAES5E SPMAES5T

Index Data

Daily constituent and index level data are available via subscription.

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

Index Data

Daily index level data is available via subscription.

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

Web site

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

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