

S&P Dow Jones Indices

A Division of **S&P Global**

S&P MARC 5% Index *Methodology*

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Introduction

Index Objective and Highlights

The S&P MARC 5% Index measures the performance of a risk-weighted strategy consisting of three sub-indices. The index is composed of three underlying component indices representing different asset classes, and adjusts the weights based on the maximum leverage of 150%:

Underlying Component Index	Asset Class Represented
S&P 500 ER (Fed Funds Rate) Index	Equities
S&P GSCI Gold Excess Return Index	Commodities
S&P 10-Year U.S. Treasury Note Futures Excess Return Index	Fixed Income

For information on the underlying component indices, please refer to their respective index methodologies available at www.spdji.com.

Please refer to Index Construction for details on each index's allocation to equities, commodities, and fixed income.

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' 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' Fixed Income Index Mathematics Methodology	Index Mathematics 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.

Index Construction

Approach

The index allocates among three sub-indices based on their respective realized volatilities.

The underlying commodities and fixed income indices are calculated and published by S&P Dow Jones Indices on a daily basis as excess return indices. For purposes of the S&P MARC 5% Index, an excess return version of the S&P 500 is calculated from the S&P 500 Total Return Index as follows and is used as the underlying equities component index.

$$SP500\ ER\ (fed\ funds\ rate)_t = \left(\frac{SP500\ TR\ Index_t}{SP500\ TR\ Index_{t-1}} - 1 \right) - \left(InterestRate_{t-1} * \frac{NumDays_t}{360} \right)$$

$$SP500\ ER\ (fed\ funds\ rate)\ Index_t = SP500\ ER\ (fed\ funds\ rate)\ Index_{t-1} * (1 + SP500\ ER\ (fed\ funds\ rate)_t)$$

where:

$$InterestRate = \text{Effective Federal Funds Rate.}$$

To calculate the target allocation for each asset class, the index:

1. Uses an exponentially weighted model to calculate the realized variance of each underlying component index and the realized covariance between them.
2. Adjusts the underlying component index weights based on the maximum leverage of 150%.
3. Targets 5% volatility.
4. Uses a short- and long-term decay factor of 94% and 97%, respectively, to calculate the volatilities.

As part of the daily rebalancing, the following are calculated:

1. The short- and long-term variance and covariance numbers for all three underlying component indices as defined in *Index Level Calculations* on the following pages.
2. The weights for each of the three underlying component indices are calculated using the following formula:

$$W_{L,t}^A = \frac{(Variance_{L,t}^A)^{-1/2}}{\sum_B (Variance_{L,t}^B)^{-1/2}}$$

3. The realized volatility of the underlying component indices using the following formula:

$$RealizedVolatility_t = \sqrt{252 \cdot \max(PortfolioVar_{L,t}, PortfolioVar_{S,t})}$$

where:

$$\begin{aligned} PortfolioVar_{L,t} = & W_{L,t}^{Eq^2} * Variance_{L,t}^{Eq} + W_{L,t}^{FI^2} * Variance_{L,t}^{FI} + W_{L,t}^{Com^2} * Variance_{L,t}^{Com} + \\ & 2 * Covariance_{L,t}^{Eq,FI} W_{L,t}^{Eq} W_{L,t}^{FI} + 2 * Covariance_{L,t}^{Eq,Com} W_{L,t}^{Eq} W_{L,t}^{Com} + \\ & 2 * Covariance_{L,t}^{FI,Com} W_{L,t}^{FI} W_{L,t}^{Com} \end{aligned}$$

$$\begin{aligned}
PortfolioVar_{S,t} = & W_{L,t}^{Eq^2} * Variance_{S,t}^{Eq} + W_{L,t}^{FI^2} * Variance_{S,t}^{FI} + W_{L,t}^{Com^2} * Variance_{S,t}^{Com} + \\
& 2 * Covariance_{S,t}^{Eq,FI} W_{L,t}^{Eq} W_{L,t}^{FI} + 2 * Covariance_{S,t}^{Eq,Com} W_{L,t}^{Eq} W_{L,t}^{Com} + \\
& 2 * Covariance_{S,t}^{FI,Com} W_{L,t}^{FI} W_{L,t}^{Com}
\end{aligned}$$

4. The total return and excess return index values as described in *Index Level Calculations* below.

Index Level Calculations

On any business day t when the index is calculated, the excess return and total return index values are calculated using the following formulas:

$$Excess\ Return_t = \sum_A AdjW_{t-2} * W_{t-2}^A * \left(\frac{Index_t^A}{Index_{t-1}^A} - 1 \right)$$

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

$$IndexER_t = IndexER_{t-1} * (1 + Excess\ Return_t)$$

$$IndexTR_t = IndexTR_{t-1} * (1 + Total\ Return_t)$$

where:

$$AdjW_{t-2} = \text{Min}(\text{Max Leverage}, \frac{\text{Target Volatility}}{\text{Realized Volatility}_{t-2}})$$

W_t^A = The weight of the respective underlying component index (A) as of time t .

$Index_t^A$ = The excess return index level of the respective underlying component index A as of time t .

$InterestRate_{t-1}$ = 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 t .

Exponentially Weighted Variance and Covariance. On any business day t when the index is calculated, the index calculates the realized short- and long-term variances and covariances of the underlying component indices. The calculations are based on exponentially weighted moving averages, and are as follows:

$Variance_{S,t}^A$ = The short-term variance for index A, at time t , is calculated as:

$$Variance_{S,t}^A = \begin{cases} \lambda_S Variance_{S,t-1}^A + (1 - \lambda_S) \left[\ln \left(\frac{Index_t^A}{Index_{t-1}^A} \right) \right]^2 & \text{if } t > T_0 \\ \sum_{i=m+1}^{T_0} \frac{\alpha_{S,i,m}}{W_{FS}} \left[\ln \left(\frac{Index_i^A}{Index_{i-1}^A} \right) \right]^2 & \text{if } t = T_0 \end{cases} \quad (1a)$$

$Variance_{L,t}^A$ = The long-term variance for index A, at time t , is calculated as:

$$Variance_{L,t}^A = \begin{cases} \lambda_L Variance_{L,t-1}^A + (1 - \lambda_L) \left[\ln \left(\frac{Index_t^A}{Index_{t-1}^A} \right) \right]^2 & \text{if } t > T_0 \\ \sum_{i=m+1}^{T_0} \frac{\alpha_{L,i,m}}{W_{FL}} \left[\ln \left(\frac{Index_i^A}{Index_{i-1}^A} \right) \right]^2 & \text{if } t = T_0 \end{cases} \quad (1b)$$

$Covariance_{S,t}^{A,B}$ = The short-term covariance between index A and B, at time t , is calculated as:

$$Covariance_{S,t}^{A,B} = \begin{cases} \lambda_S Covariance_{S,t-1}^{A,B} + (1 - \lambda_S) \ln\left(\frac{Index_t^A}{Index_{t-1}^A}\right) \ln\left(\frac{Index_t^B}{Index_{t-1}^B}\right) & \text{if } t > T_0 \\ \sum_{i=m+1}^{T_0} \frac{\alpha_{S,i,m}}{WF_S} \ln\left(\frac{Index_i^A}{Index_{i-1}^A}\right) \ln\left(\frac{Index_i^B}{Index_{i-1}^B}\right) & \text{if } t = T_0 \end{cases} \quad (1c)$$

$Covariance_{L,t}^{A,B}$ = The long-term covariance between index A and B, at time t , is calculated as:

$$Covariance_{L,t}^{A,B} = \begin{cases} \lambda_L Covariance_{L,t-1}^{A,B} + (1 - \lambda_L) \ln\left(\frac{Index_t^A}{Index_{t-1}^A}\right) \ln\left(\frac{Index_t^B}{Index_{t-1}^B}\right) & \text{if } t > T_0 \\ \sum_{i=m+1}^{T_0} \frac{\alpha_{L,i,m}}{WF_L} \ln\left(\frac{Index_i^A}{Index_{i-1}^A}\right) \ln\left(\frac{Index_i^B}{Index_{i-1}^B}\right) & \text{if } t = T_0 \end{cases} \quad (1d)$$

where:

- T_0 = The start date of the S&P MARC 5% Index.
- n = The number of days in the return calculation. $n = 1$ as daily returns are used to calculate realized volatility.
- m = The m^{th} trading date prior to T_0 .
- N = The number of trading days observed for calculating the initial variance as of the start date of the index. $N = 60$.
- λ_S = The short-term decay factor used for exponential weighting. The decay factor is a number greater than zero and less than one that determines the weight of each daily return in the calculation of historical variance.
- λ_L = The long-term decay factor used for exponential weighting. The decay factor is a number greater than zero and less than one that determines the weight of each daily return in the calculation of historical variance.
- $\alpha_{S,m,i}$ = Weight of date t in the short-term volatility calculation, as calculated based on the following formula:

$$\alpha_{S,t} = (1 - \lambda_S) * \lambda_S^{N+m-i} \quad (2a)$$

$$WF_S = \sum_{i=m+1}^{T_0} \alpha_{S,i,m} \quad (2b)$$

- $\alpha_{L,m,i}$ = Weight of date t in the long-term volatility calculation, as calculated based on the following formula:

$$\alpha_{L,t} = (1 - \lambda_L) * \lambda_L^{N+m-i} \quad (2c)$$

$$WF_L = \sum_{i=m+1}^{T_0} \alpha_{L,i,m} \quad (2d)$$

Index Maintenance

Rebalancing

The index is rebalanced daily after the market close, following the U.S. equity market trading calendar. If an underlying component index is not published on the rebalancing date, the prior value of that component is used. As part of the rebalancing process, the weights of the various asset class components are determined based on the asset class weights in the underlying component indices as described in *Index Construction*.

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.

Currency of Calculation and Additional Index Return Series

The index is calculated 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 [S&P DJI Methodology & Regulatory Status Database](#).

For information on the calculation of different types of indices, 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 MARC 5% Index	03/27/2017	12/06/1989	12/06/1989	100

Index Governance

Index Committee

An S&P Dow Jones Indices' Index Committee maintains the index. The Committee meets regularly. At each meeting, the Committee reviews matters that may affect index constituents, statistics comparing the composition of the index to the market, and any significant market events. In addition, the Index Committee may revise index policy covering rules for selecting constituents, 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

Holiday Schedule

The index is calculated on all U.S. equity market business days.

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	RIC
S&P MARC 5% Index	Excess Return	SPMARC5P	.SPMARC5P
	Total Return	SPMARC5T	.SPMARC5T

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.

Web site

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

Appendix

EU Required ESG Disclosures

EXPLANATION OF HOW ENVIRONMENTAL, SOCIAL & GOVERNANCE (ESG) FACTORS ARE REFLECTED IN THE KEY ELEMENTS OF THE BENCHMARK METHODOLOGY¹		
1.	Name of the benchmark administrator.	S&P Dow Jones Indices LLC.
2.	Underlying asset class of the ESG benchmark.²	N/A
3.	Name of the S&P Dow Jones Indices benchmark or family of benchmarks.	S&P DJI Multi-Asset Indices Benchmark Statement
4.	Do any of the indices maintained by this methodology take into account ESG factors?	No
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¹ The information contained in this Appendix is intended to meet the requirements of the European Union Commission Delegated Regulation (EU) 2020/1817 supplementing Regulation (EU) 2016/1011 of the European Parliament and of the Council as regards the minimum content of the explanation of how environmental, social and governance factors are reflected in the benchmark methodology.

² The 'underlying assets' are defined in European Union Commission Delegated Regulation (EU) 2020/1816 supplementing Regulation (EU) 2016/1011 of the European Parliament and of the Council as regards the explanation in the benchmark statement of how environmental, social and governance factors are reflected in each benchmark provided and published.

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