S&P Dow Jones Indices

A Division of S&P Global

S&P 500 Gold Allocator Indices
Methodology

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Introduction

Index Objective and Highlights

The S&P 500 Gold Allocator Indices measure the performance of a rolling basket of five-year Rainbow Notes linked to the S&P 500 and S&P GSCI Gold Index through the use of the respective futures. The index measures a basket that maintains exposure to 60 active notes, with one note issued at each month-end over the preceding five years. As notes mature, the redemption proceeds systematically reinvest into newly issued notes at the corresponding month-end.

For more information on the S&P 500 Futures Index ER and S&P GSCI Gold ER, please refer to the S&P Futures Indices Methodology, available at www.spglobal.com/spdji.

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' Index Mathematics Methodology	Index Mathematics Methodology
S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology	Equity Indices Policies & Practices

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

Index Calculation

For each index calculation day t after the Base Date, the closing level of the S&P 500 Gold Allocator Index (USD) TR calculates as follows:

$$Index_t = Index_{t-1} * \left(\frac{P_t}{P_{t-1}} + EFFR_{t-1} \frac{ACT(t-1,t)}{360} \right)$$

where:

$Index_t$ = The closing level of the S&P 500 Gold Allocator Index (USD) TR for day t

P_t = The aggregate basket value of component Rainbow Notes on day t

$EFFR_t$ = The effective Fed funds rate on day t

For each index calculation day t, the aggregate basket value calculates as:

$$P_t = \sum_{i \in \omega_t} V_{i,t} Q_{i,t}$$

where:

$V_{i,t}$ = The value of Rainbow Note i on day t

$Q_{i,t}$ = The quantity of Rainbow Note i on day t

ω_t = The set of Rainbow Notes active on day t, with size set to 60

Basket Construction

The index adds one Rainbow Note on each monthly roll date. Each Rainbow Note matures on the n_{th} monthly roll date following the note's issuance date. Accordingly, the index maintains 60 active Rainbow Notes after completion of the initial basket formation period.

Prior to the Base Date, the index's initial formation period establishes the basket of Rainbow Note vintages. One Rainbow Note rolls on the last index calculation date of each month. On the Base Date, the basket comprises n active Rainbow Notes with staggered remaining terms.

Rainbow Note Quantity Calculation

For each active Rainbow Note i, the quantity of notes in the basket on each index calculation day calculates as follows:

$$Q_{i,t} = \begin{cases} 1, & t = BaseDate \\ Q_{i,t-1} + \min\left(1, \frac{B_t}{\varepsilon_t}\right)\left(Q_t^{\varepsilon} - Q_{i,t-1}\right) + \frac{\max(0, B_t - \varepsilon_t)}{\alpha_t}, & t = Roll\ Date \\ Q_{i,t-1}, & \text{otherwise} \end{cases}$$

where:

$Q_{i,t}$ = The quantity of Rainbow Note i held by the Index on day t

B_t = The settlement payoff generated by the Rainbow Note position expiring on the monthly roll date t

Q_t^{ε} = The target quantity level on the monthly roll date t

ε_t = The quantity-equalization level on monthly roll date t

α_t = The aggregate price of all Rainbow Notes active as of monthly roll date t

For each monthly roll date t, the settlement payoff generated by the maturing Rainbow Note position calculates as follows:

$$B_t = \sum_{i \in E_t} \max\left(\frac{X_t^{(1)}}{X_{t_i}^{(1)}}, \frac{X_t^{(2)}}{X_{t_i}^{(2)}}\right) * Q_{i,t-1}$$

where:

$X_t^{(1)}$ = The index value of the S&P 500 Gold 80/20 20% VC Index

$X_t^{(2)}$ = The index value of the S&P 500 Gold 20/80 20% VC Index

t_i = The initiation date of Rainbow Note i

B_t = The settlement payoff generated by the Rainbow Note position expiring on the monthly roll date t

E_t = The set of Rainbow Notes expiring on the monthly roll date t, with size equal to 1

For each monthly roll date t, the quantity-equalization target calculates as follows:

$$Q_t^{\varepsilon} = max_{i \in \omega_t} Q_{i,t-1}$$

For each monthly roll date t, the aggregate value required to equalize all expiring notes calculates to the target quantity as follows:

$$\varepsilon_t = \sum_{i \in \omega_t} V_{i,t} \left(Q_t^{\varepsilon} - Q_{i,t-1}\right) = \sum_{i \in E_t} V_{i,t} * Q_t^{\varepsilon}$$

For each monthly roll date t, the aggregate price of all active Rainbow Notes calculates as follows:

$$\alpha_t = \sum_{i \in \omega_t} V_{i,t}$$

Rainbow Note Valuation

The value for each Rainbow Note i on index calculation day t from the note's issuance date up to, and excluding, the note's maturity date, t_{i+n}, calculates as follows:

$$V_{i,t} = \Delta_{i,t}^{(1)} + \Delta_{i,t}^{(2)}$$

$$\Delta_{i,t}^{(1)} = \frac{X_t^{(1)}}{X_{t_i}^{(1)}} * N\left(\frac{\ln\left(\frac{X_t^{(1)}/X_{t_i}^{(1)}}{X_t^{(2)}/X_{t_i}^{(2)}}\right)}{\sigma_{i,t}} + \frac{1}{2}\sigma_{i,t}\right)$$

$$\Delta_{i,t}^{(2)} = \frac{X_t^{(2)}}{X_{t_i}^{(2)}} * N\left(\frac{\ln\left(\frac{X_t^{(2)}/X_{t_i}^{(2)}}{X_t^{(1)}/X_{t_i}^{(1)}}\right)}{\sigma_{i,t}} + \frac{1}{2}\sigma_{i,t}\right)$$

where:

$N(\cdot)$ = The standard normal cumulative distribution function

$\sigma_{i,t}$ = The time-adjusted Rainbow Note spread volatility for Rainbow Note i on day t

On each index calculation date, the time-adjusted Rainbow Note spread volatility calculates as follows:

$$\sigma_{i,t} = VT\sqrt{dt_{t,t_{i+n}}}$$

where:

$dt_{t,t_{i+n}}$ = The Actual/365 day-count fraction between day t and the maturity date t_{i+n} for Rainbow Note i

VT = The spread volatility

Volatility Target Index Calculation

The S&P 500 Gold 80/20 20% VC Index and the S&P 500 Gold 20/80 20% VC Index calculate by applying a volatility-control mechanism to the respective blend indices. Note that for versions of the volatility control ($X_t^{(j)}$) and headline gold allocator ($Index_t$) indices which do not contain transaction costs, $k = 0$ and $\mu = 0$ in the equations below:

$$X_t^{(j)} = X_{t-1}^{(j)}\left[1 + E_{t-1}^{(j)} * \left(\left(\frac{A_t^{(j)}}{A_{t-1}^{(j)}} - 1\right) - \mu * \frac{ACT(t,t-1)}{365}\right)\right] - TC_t^{(j)}$$

The transaction cost calculates as

$$TC_t^{(j)} = k * \left(w_{ES}^{(j)} * \left|X_{t-1}^{(j)} * E_{t-1}^{(j)} - X_{t-2}^{(j)} * E_{t-2}^{(j)} * \frac{ES_{t-1}}{ES_{t-2}}\right| + \left(1 - w_{ES}^{(j)}\right) * \left|X_{t-1}^{(j)} * E_{t-1}^{(j)} - X_{t-2}^{(j)} * E_{t-2}^{(j)} * \frac{GC_{t-1}}{GC_{t-2}}\right|\right)$$

where:

$A_t^{(j)}$ = The blend index corresponding to the volatility control index $X_t^{(j)}$ on date t

μ = The annual replication cost, equal to 0.0012 (when transaction costs apply) and equal to 0 (when no transaction costs apply)

k = The transaction cost rate, equal to 0.0002 (when transaction costs apply) and equal to 0 (when no transaction costs apply)

$TE_t^{(j)}$ = The target exposure of the blend index $A_t^{(j)}$ for volatility control index $X_t^{(j)}$ on date t

$E_t^{(j)}$ = The exposure of the blend index $A_t^{(j)}$ for volatility control index $X_t^{(j)}$ on date t

$RVol_t^{(j)}$ = The realized volatility of the blend index $A_t^{(j)}$ calculated using Short-Term and Long-Term EWMA Variance calculations on date t

j = The superscript index denotes the applicable 80/20 or 20/80 allocation variant of the S&P 500 Gold 20% VC Index

ES_t = The index level of the S&P 500 Futures Index ER on date t

GC_t = The index level of the S&P GSCI Gold Index ER on date t

The exposure, $E_{t-1}^{(j)}$, for index calculation date t, calculates as[1]:

$$E_t^{(j)} = E_{t-1}^{(j)} + max(-0.5, min(TE_t^{(j)} - E_{t-1}^{(j)}, 0.5))$$

$$TE_t^{(j)} = min\left(1.5, \frac{0.20}{RVol_{t-1}^{(j)}}\right)$$

The realized volatility calculates as:

$$RVol_{t-1}^{(j)} = \sqrt{252 * max(Var^{(S,j)}, Var^{(L,j)})}$$

On index calculation dates after the base date, the EWMA variance of the applicable blend index calculates on each index calculation day:

$$Var_t^{(S,j)} = 0.93 * Var_{t-1}^{(S,j)} + (1 - 0.93) * \left[ln\left(\frac{A_t^{(j)}}{A_{t-1}^{(j)}}\right)\right]^2$$

$$Var_t^{(L,j)} = 0.97 * Var_{t-1}^{(L,j)} + (1 - 0.97) * \left[ln\left(\frac{A_t^{(j)}}{A_{t-1}^{(j)}}\right)\right]^2$$

On the base date:

$$Var_{w,0}^{(S,j)} = Var_{w,0}^{(L,j)} = \left(\frac{0.20}{\sqrt{252}}\right)^2$$

[1] On the index base date, the exposure is set to 1.

Blend Index Calculation

For index calculation date t , the blend indices calculate as follows**:**

$$A_t^{(j)} = A_{t-1}^{(j)} + N_{t,ES}^{(j)} * (ES_t - ES_{t-1}) + N_{t,GC}^{(j)} * (GC_t - GC_{t-1})$$

where:

$N_{t,ES}^{(j)}$ = The units of the S&P 500 Futures Index ER for Blend Index $A_t^{(j)}$ on date t

$N_{t,GC}^{(j)}$ = The units of the S&P GSCI Gold Index ER for Blend Index $A_t^{(j)}$ on date t

The blend index units calculate as follows:

$$N_{t,ES}^{(j)} = w_{ES}^{(j)} * \frac{A_{t-1}^{(j)}}{ES_{t-1}}$$

$$N_{t,GC}^{(j)} = (1 - w_{ES}^{(j)}) * \frac{A_{t-1}^{(j)}}{GC_{t-1}}$$

$$w_{ES}^{(j)} = \begin{cases} 0.80, & j = 1 \\ 0.20, & j = 2 \end{cases}$$

Index Maintenance

Monthly Roll

The S&P 500 Gold Allocator Index (USD) roll date is the last trading day of the month.

Currency of Calculation and Additional Index Return Series

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 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 Gold 20/80 20% VC Index (USD) ER	11/06/2026	01/31/2005	01/31/2005	100
S&P 500 Gold 80/20 20% VC Index (USD) ER	11/06/2026	01/31/2005	01/31/2005	100
S&P Gold Allocator Index (USD) ER	11/06/2026	01/31/2000	01/31/2000	100
S&P Gold Allocator Index (USD) TR	11/06/2026	01/31/2000	01/31/2000	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 index committee maintains the index. All committee members are full-time professional members of S&P Dow Jones Indices' staff. The Index 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 Equity Indices Policies & Practices Methodology.

Index Policy

Announcements

Announcements of the daily index values are made after the market close each day.

For more information, please refer to the Announcements section of S&P Commodities Indices Policies & Practices Methodology.

Holiday Schedule

The index calculates on the days specified in the calculation calendar, available 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 Commodities Indices Policies & Practices Methodology.

Recalculation Policy

Intraday index calculations are executed for some index versions whenever the index's primary exchanges are open. In case an issue arises during calculation, the index is restated, based on feasibility assessment by the index committee, for every reported intraday index level period following the issue.

Real-Time Calculation

Real-time, intraday, 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 Commodities 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.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	BBG	RIC
S&P 500 Gold 20/80 20% VC Index (USD) ER	SPGVC28E	.SPGVC28E
S&P 500 Gold 80/20 20% VC Index (USD) ER	SPGVC82E	.SPGVC82E
S&P Gold Allocator Index (USD) ER	SPGOALER	.SPGOALER
S&P Gold Allocator Index (USD) TR	SPGOALTR	.SPGOALTR

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*.

Disclaimer

Performance Disclosure/Back-Tested Data

Where applicable, S&P Dow Jones Indices and its index-related affiliates ("S&P DJI") defines various dates to assist our clients by 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 to a fixed value for calculation purposes. The Launch Date designates the date when 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 DJI 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 data feed 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.

Please refer to the methodology for the Index 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.

Information presented prior to an index's launch date is hypothetical back-tested performance, not actual performance, and is based on the index methodology in effect on the 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. In addition, forks have not been factored into the back-test data with respect to the S&P Cryptocurrency Indices. For the S&P Cryptocurrency Top 5 & 10 Equal Weight Indices, the custody element of the methodology was not considered; the back-test history is based on the index constituents that meet the custody element as of the Launch Date. Also, the treatment of corporate actions in back-tested performance may differ from treatment for live indices due to limitations in replicating index management decisions. Back-tested performance reflects application of an index methodology and selection of index constituents with the benefit of hindsight and knowledge of factors that may have positively affected its performance, cannot account for all financial risk that may affect results and may be considered to reflect survivor/look ahead bias. Actual returns may differ significantly from, and be lower than, back-tested returns. Past performance is not an indication or guarantee of future results.

Typically, when S&P DJI creates back-tested index data, S&P DJI uses actual historical constituent-level data (e.g., historical price, market capitalization, and corporate action data) in its calculations. As ESG investing is still in early stages of development, certain datapoints used to calculate certain ESG indices may not be available for the entire desired period of back-tested history. The same data availability issue could be true for other indices as well. In cases when actual data is not available for all relevant historical periods, S&P DJI may employ a process of using "Backward Data Assumption" (or pulling back) of ESG data for the calculation of back-tested historical performance. "Backward Data Assumption" is a process that applies the earliest actual live data point available for an index constituent company to all prior historical instances in the index performance. For example, Backward Data Assumption inherently assumes that companies currently not involved in a specific business activity (also known as "product involvement") were never involved historically and similarly also assumes that companies currently involved in a specific business activity were involved historically too. The Backward Data Assumption allows the hypothetical back-test to be extended over more historical years than would be feasible using only actual data. For more information on "Backward Data Assumption" please refer to the FAQ. The methodology and factsheets of any index that employs backward assumption in the back-tested history

will explicitly state so. The methodology will include an Appendix with a table setting forth the specific data points and relevant time period for which backward projected data was used. Index returns shown do not represent the results of actual trading of investable assets/securities. S&P DJI maintains the index and calculates the index levels and performance shown or discussed but does not manage any 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).

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