S&P Dow Jones Indices

A Division of S&P Global

S&P Risk Parity 2.0 Indices
Methodology

August 2021

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Introduction

Index Objective and Highlights

The S&P Risk Parity 2.0 Indices measure the performance of a multi-asset risk parity strategy that allocates predetermined risk exposure among TIPS and futures contracts on equities, nominal bonds, and commodities. The indices follow a quantitative methodology to assign 15% risk exposure to TIPS, and 28.3% risk exposure to each of the other three asset classes. The S&P Risk Parity 2.0 Indices are leveraged to achieve their predetermined target volatilities.

Compared with other asset classes, TIPS includes the U.S. 7-10 Year TIPS only. As a cash instrument, its post leverage weight is capped at 100%. 15% risk exposure is assigned to TIPS to balance between inflation hedge and risk-adjusted performance.
The key characteristics of the indices are:

- 26 constituents, including 25 futures contracts, grouped into four asset classes: equity, bonds, TIPS, and commodities
- The 25 non-TIPS constituents are represented by component indices measuring the performance of a rolling position of each underlying contract month
- Nominal bond constituents are equal weighted by notional in the bond asset class
- Commodities constituents contribute equal risk within the commodities asset class
- Equity constituents contribute equal risk within the equity asset class.
- TIPS contribute 15% and each of the other asset classes contributes $28.\overline{3}\%$ risk in each index.

For information on the component indices by asset class, please refer to the S&P Equity Futures and Currency Futures Indices Methodology, S&P Global Bond Futures Index Series Methodology, and S&P GSCI Methodology documents, respectively, available at www.spdji.com.

Index Family

The index family includes the following:

- S&P Risk Parity 2.0 Index – 8% Target Volatility
- S&P Risk Parity 2.0 Index – 10% Target Volatility
- S&P Risk Parity 2.0 Index – 12% Target Volatility
- S&P Risk Parity 2.0 Index – 15% Target Volatility

Note that the target volatilities are used to determine index leverage based on the long term realized volatilities. The actual index realized volatility may deviate from the predetermined target volatilities.

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

The index methodology is maintained, and the indices are calculated and managed independently by S&P Dow Jones Indices according to S&P Dow Jones Indices' standard policies and procedures, including the policies and procedures governing S&P Dow Jones Indices' independent Index Committee. 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 indices continue to achieve their objectives.

Index Eligibility and Construction

Contract Eligibility

Contracts for physical commodities included in the indices are determined every two years, with a contract eligibility criteria date of September of the previous year through August of the current year, effective during the next designated January roll period. In addition, contracts must satisfy the following eligibility criteria.

Eligibility Requirements

Physical Commodities, Financial, and Foreign Exchange Futures. Contracts must be on a physical commodity, financial instrument, currency, interest rate or equity index. Contracts need not require physical delivery by their terms in order for a commodity to be considered a physical commodity.

Certain Contract Characteristics. The following criteria must be satisfied:

(i) the Contract must have a specified expiration or term, or provide in some other manner for delivery or settlement at a specified time, or within a specified time period, in the future

(ii) the Contract must, at any given point in time, be available for trading at least five months prior to its expiration or such other date or time period specified for delivery or settlement; and

(iii) the Trading Facility on which the Contract is traded must allow market participants to execute spread transactions between the pairs of Contract Expirations included in the S&P Risk Parity 2.0 Indices that, at any given point in time, are involved in the rolls effected during the next three Roll Periods.

Denomination and Geographical Requirements. Contracts must be traded on or through a Trading Facility that has its principal place of business or operations in a country that is a member of the Organization for Economic Cooperation and Development (OECD) during the relevant Annual Calculation Period or Interim Calculation Period. This assures that the S&P Risk Parity 2.0 Indices are limited to those futures for which there are Trading Facilities in industrialized countries.

Availability of Daily Contract Reference Prices. Daily Contract Reference Prices generally must have been available on a continuous basis for at least two years prior to the proposed date of inclusion. In appropriate circumstances, S&P Dow Jones Indices may determine that a shorter time period is sufficient or that historical Daily Contract Reference Prices for a given Contract may be derived from Daily Contract Reference Prices of a similar or related Contract.

Availability of Volume Data. Volume data with respect to such Contract must be available from sources satisfying the criteria specified in *Sources of Information* for at least two years immediately prior to the date on which the determination to include the contracts is made. The indices' determination date is the same as the S&P GSCI for annual volume data, the 12-month period from September through August.

Liquidity Requirement

Contracts are limited to those that are actively traded in order to assure that the prices generated by the markets for such Contracts represent reliable, competitive prices. Liquidity is an indication both of the significance of a particular market and the ability to trade with minimal market impact. Liquidity is determined by the annual Total Dollar Value Traded (TDVT).

Contract Selection

Contracts for physical commodities are determined every two years, to be applied during the January roll period on even numbered years. The data range used to make the contract determination is September of the previous year through August of the current year. The following rules determine the selection of futures contracts for the three asset classes:

- **Commodities futures contracts**. Contracts are selected from the S&P GSCI universe of futures contracts. All contracts that have a TDVT greater than $5 billion are selected. For more information on the S&P GSCI universe, please refer to the S&P GSCI Methodology document.
- **Bond futures contracts**. Seven liquid government bonds futures contracts are selected, as defined below. Their duration ranges between 5 and 30 years.
- **Equity futures contracts.** Three liquid futures contracts are selected, as defined below.
- **TIPS.** The index uses the S&P US Treasury TIPS 7-10 Year Index to simulate returns of a rolling position in TIPS.

Index constituents are not expected to change between rebalancing periods. If, for any reason beyond S&P Dow Jones Indices' control, a constituent is discontinued or substantially changed in terms of its investment mandate, the Index Committee may elect to discontinue representation of the affected futures contract within the index or designate a successor contract. The selection of futures contracts is at the discretion of the Index Committee.

EXHIBIT 1: CONSTITUENTS AND COMPONENT INDEX NAMES

Sector	Constituent	Exchange	Sector	Currency	Component Indices
Current Commodities[1]					
Commodity - Energy	Natural Gas	NYMEX	E	USD	S&P GSCI Natural Gas Index
	Heating Oil #2	NYMEX	E	USD	S&P GSCI Heating Oil Index
	Gas Oil	ICE	E	USD	S&P GSCI Gasoil Index
	Crude Oil	NYMEX	E	USD	S&P GSCI Crude Oil Index
	Brent Crude	ICE	E	USD	S&P GSCI Brent Crude Oil Index
	Gasoline	NYMEX	E	USD	S&P GSCI Unleaded Gasoline Index
Commodity - Softs & Livestock	Sugar #11	ICE	C	USD	S&P GSCI Sugar Index
	Coffee "C"	ICE	C	USD	S&P GSCI Coffee Index
	Cotton #2	ICE	C	USD	S&P GSCI Cotton Index
Commodity - Grains	Soybeans	CBOT	C	USD	S&P GSCI Soybeans Index
	Corn	CBOT	C	USD	S&P GSCI Corn Index
	Wheat	CBOT	C	USD	S&P GSCI Wheat Index
Commodity - Metals	Copper	COMEX	C	USD	S&P GSCI Copper Index
	Gold (100 oz.)	COMEX	C	USD	S&P GSCI Gold Index
	Silver	COMEX	C	USD	S&P GSCI Silver Index
Bonds					
Bonds - U.S.	T-Notes (5-year)	CBOT	FI	USD	S&P 5-Year U.S. Treasury Note Futures Index
	T-Notes (10-year)	CBOT	FI	USD	S&P 10-Year U.S. Treasury Note Futures Index
	T-Bonds (30-year)	CBOT	FI	USD	S&P U.S. Treasury Bond Futures Index
Bonds - Europe	Long Gilt	ICE	FI	GBP	S&P Long Gilt Futures Index
	Euro-Bobl	EUREX	FI	EUR	S&P Euro-Bobl Futures Index
	Euro-Bund	EUREX	FI	EUR	S&P Euro-Bund Futures Index
Bonds - Asia	JGB (10-year)	JPX	FI	JPY	S&P 10-Year JGB Futures Index
Equity					
Equity – U.S.	S&P 500 E-mini	CME	SI	USD	S&P 500 Futures ER Index
Equity - Europe	Euro Stoxx 50	EUREX	SI	EUR	Euro Stoxx 50 Futures Index
Equity - Asia	Nikkei 225 Futures	JPX	SI	JPY	Nikkei 225 Futures Index
TIPS					
TIPS	TIPS 7-10 Years			USD	S&P US Treasury TIPS 7-10 Year Index

[1] The next review period for the Commodities contracts is September 2020 through September 2021, effective in January 2022.

Weighting Scheme

The weighting scheme seeks to create an index where TIPS contributes 15% and each of the other three asset classes contributes $28.\overline{3}\%$ to the index risk. To achieve the desired weighting scheme, an optimizer is used to find the optimal weights so that the difference between the predetermined risk exposure and the marginal risk contribution of each component is minimized.

Step 1: constructing each asset class

Bonds

On each reference day *t*, the constituents within the Bond asset class are weighted equally by notional.

Commodities and Equities

On each reference day *t*, the Commodities / Equities asset class is constructed so that the constituents contributes equal risk within the asset class.

the marginal risk contribution of the *i*-th constituent to the *k*-th asset class is defined as:

$$mc_{i,k,t} = w_{i,k,t} \frac{\text{cov}(\sigma_{i,t}, \sigma_{k,t})}{\sigma_{k,t}}$$

where:

$mc_{i,k,t}$= marginal risk contribution of the *i*-th constituent to the *k*-th asset class, on day *t*

$w_{i,k,t}$ = weight of the *i*-th constituent within the *k*-th asset class, on day *t*

$\sigma_{k,t}$ = volatility of the *k*-th asset class, on day *t*

$\text{cov}(\sigma_{i,t}, \sigma_{k,t})$ = covariance between the *i*-th constituent and the *k*-th asset class, on day *t*

An optimizer is used to find $w_{i,k,t}$ so that the pairwise difference of $mc_{i,k,t}$ is minimized by minimizing the following function:

$$\sum_{i} \sum_{i' \neq i} \left(mc_{i,k,t} - mc_{i',k,t}\right)^2$$

subject to the following constraints:

$$\sum_{i} w_{i,k,t} = 1$$

$$w_{i,k,t} \geq 0 \text{ for each } i \text{ in } k$$

Step 2: constructing the hypothetical risk parity portfolio

After each asset class is constructed, the marginal risk contribution of the *k*-th asset class to the index is defined as:

$$mc_{k,t} = w_{k,t} \frac{\text{cov}(\sigma_{k,t}, \sigma_{t})}{\sigma_{t}}$$

where:

$mc_{k,t}$= marginal risk contribution of the *k*-th asset class to the index, on day *t*

$w_{k,t}$ = weight of the *k*-th asset class within the index, on day *t*

σ_t = volatility of the index, on day *t*

$\operatorname{cov}(\sigma_{k,t}, \sigma_t)$ = covariance between the *k*-th asset class and the index, on day *t*

An optimizer is then used to find $w_{k,t}$ so that the difference between $mc_{k,t}$ and its target risk contribution is minimized by minimizing the following function:

$$\sum_k (mc_{k,t} - tmc_k)^2$$

subject to the following constraints:

$$\sum_i w_{k,t} = 1$$

$$w_{k,t} \geq 0 \text{ for each class } k$$

where:

tmc_k = target risk contribution of the *k*-th asset class to the index, on day *t* (see table below).

EXHIBIT 2:

Asset Class	Target Risk Contribution
Commodities	$28.\bar{3}\%$
Bonds	$28.\bar{3}\%$
Equities	$28.\bar{3}\%$
TIPS	15%

Step 3: calculating leverage

If an index has a target volatility, the index calculates the leverage using the realized volatility of the multi-asset portfolio. The leverage is constrained so that TIPS weight does not exceed 100% post leverage.

$$L_t = \min\left(\frac{TV}{RV_t}, \frac{100\%}{w_{TIPS,t}}\right)$$

where:

TV = target volatility of the index

RV_t = realized volatility of the portfolio, on day *t*

$w_{TIPS,t}$ = unleveraged weight of TIPS, on day *t*

The leverage is calculated on the rebalancing reference day and applied on the rebalancing effective day to the target weights.

The calculation of the realized covariances and realized volatility uses a lookback window that starts with a minimum 1260 trading days (5 years), expands when prices are available, and is capped at a maximum 3780 trading days (15 years).

EXHIBIT 3:

Parameters	Values
Minimum number of trading days in the look-back period (MinN)	1260
Maximum number of trading days in the look-back period (MaxN)	3780

Sources of Information

The following are the sources of the information used to determine the eligibility of Contracts for inclusion in the S&P Risk Parity 2.0 Indices, pursuant to the requirements set forth in *General Eligibility*

Requirements. If any of the sources identified below is unavailable, with respect to the determination of the S&P Risk Parity 2.0 Indices for a particular S&P Risk Parity 2.0 Index Year, S&P Dow Jones Indices will identify appropriate alternative sources and the composition of the S&P Risk Parity 2.0 Indices for such year will be based on such alternative sources. In addition, if S&P Dow Jones Indices, in its reasonable judgment, believes that one or more of the sources identified below contains a manifest error, it may use an alternative source to obtain the necessary information. Any such alternative sources used by S&P Dow Jones Indices will be publicly disclosed at the time that the composition of the indices for the next S&P Risk Parity 2.0 Index Year is announced.

General Eligibility Requirements. The identification of those commodities that satisfy the general eligibility requirements is based on the FIA Reports that are published with respect to the relevant Annual Calculation Period or Interim Calculation Period, and directly from the particular Trading Facilities. The determination as to whether a particular Trading Facility has its principal place of business or operations in an OECD country is based on the most recent data published by the OECD available on the date of determination.

Contract Volume and Liquidity Requirements. In order to determine whether a particular Contract satisfies the volume and liquidity requirements described above, S&P Dow Jones Indices may use any available sources that it believes to be reasonably reliable including, but not limited to, data contained in the FIA Reports. In the event of manifest error, S&P Dow Jones Indices may supplement, and make corrections to, any such data.

Index Maintenance

Rebalancing

Constituent weights are calculated after the close of the last business day of each month (the reference day) and become effective prior to the open of the third trading day of the next month (the rebalancing day).

For the roll schedule of a specific underlying constituent, please refer to the methodology of the component index.

Calculation Calendar

The S&P Risk Parity 2.0 Indices follows New York Stock Exchange calendar. On any index calculation day that a constituent is not traded, its price on the previous business day of its local market will be used in the index calculation.

Currency of Calculation and Additional Index Return Series

The indices calculate in U.S. dollars. Forex rates, as supplied by WM/Refinitiv, are used for local currency return calculation. The index uses the spot exchange rates provided by WM/Refinitiv at 04:00 PM London Time.

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 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.spdji.com.

Base Dates and History Availability

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 Risk Parity 2.0 Index – 8% Target Volatility	08/17/2021	06/01/2005	06/01/2005	1000
S&P Risk Parity 2.0 Index – 10% Target Volatility	08/17/2021	06/01/2005	06/01/2005	1000
S&P Risk Parity 2.0 Index – 12% Target Volatility	08/17/2021	06/01/2005	06/01/2005	1000
S&P Risk Parity 2.0 Index – 15% Target Volatility	08/17/2021	06/01/2005	06/01/2005	1000

Index Calculation

The Excess Return (ER) and Total Return (TR) indices calculate as weighted return indices.

For more information on index calculation, please refer to the Weighted Return Indices section in S&P Dow Jones Indices: Index Mathematics Methodology.

Index Governance

Index Committee

An S&P Dow Jones Indices' Index Committee maintains the indices. The Committee meets regularly. The Committee may revise index policy covering rules for the selection of futures contracts, including the eligibility criteria, or other matters. The Index Committee consists solely of full-time employees of S&P Dow Jones Indices.

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' Commodities Indices Policies & Practices Methodology.

Index Policy

Holiday Schedule

The indices calculate daily and follow the official NYSE holiday schedule.

For information on Calculations and Pricing Disruptions, Expert Judgment, Data Hierarchy, and Unexpected Exchange Closures, please refer to S&P Dow Jones Indices' 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.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 the S&P DJI Methodology & Regulatory Status Database for a complete list of indices covered by this document.

Index	Index Code
S&P Risk Parity 2.0 Index – 8% Target Volatility ER	SPERC8
S&P Risk Parity 2.0 Index – 8% Target Volatility TR	SPERC8T
S&P Risk Parity 2.0 Index – 10% Target Volatility ER	SPERC10
S&P Risk Parity 2.0 Index – 10% Target Volatility TR	SPERC10T
S&P Risk Parity 2.0 Index – 12% Target Volatility ER	SPERC12
S&P Risk Parity 2.0 Index – 12% Target Volatility TR	SPERC12T
S&P Risk Parity 2.0 Index – 15% Target Volatility ER	SPERC15
S&P Risk Parity 2.0 Index – 15% Target Volatility TR	SPERC15T

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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