S&P Dow Jones Indices

A Division of S&P Global

S&P Carbon Efficient Fixed Income Index *Methodology*

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S&P Dow Jones Indices: Index Methodology

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Introduction

Index Objective

Each S&P Carbon Efficient Fixed Income Index measures the performance of corporate debt in a respective underlying index, while overweighting or underweighting securities based upon the level of carbon emissions of their GICS sector, individual issuers' carbon intensity, and effective duration.

Highlights

Constituents' weights are adjusted from underlying index weights with a classification system that covers three aspects:

- **Issuer GICS Sector Carbon Emissions:** GICS sectors are classified into quantile groups of 1, 2, and 3 (low, mid, and high carbon emissions), based on total carbon dioxide equivalent (CO_2e) emissions in that sector.
- **Individual Issuer Carbon Intensity:** Bond issuers are classified into quantile groups of 1, 2 and 3 (low, mid, and high carbon intensity) within each sector, based on the carbon intensity of the issuer's parent company.
- **Individual Issue Effective Duration:** To consider carbon pricing risk in the future, a bond with lower effective duration is overweighted, while a bond with higher effective duration is underweighted.

Index Family

The index series includes the following indices:

- S&P 500 Bond Investment Grade Carbon Efficient Index

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, are as follows:

Supporting Document	URL
S&P Dow Jones Indices' Fixed Income Policies & Practices Methodology	Fixed Income Policies & Practices
S&P Dow Jones Indices' Fixed Income Index Mathematics Methodology	Fixed Income Index Mathematics 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 and Index Construction

Index Universe

At each rebalancing, each index universe is all constituents of the underlying index, as detailed below:

Index	Underlying Index
S&P 500 Bond Investment Grade Carbon Efficient Index	S&P 500 Investment Grade Corporate Bond Index

For more information on an underlying index, please refer to its respective methodology document available at www.spglobal.com/spdji/.

Constituent Selection

At each rebalancing, all bonds in the underlying index, as of the rebalancing reference date, are selected and form the index.

Carbon Emissions

Carbon emissions refer to levels of absolute greenhouse gas (GHG) emissions, measured in metric tons of carbon dioxide equivalent (CO_2e) emissions. The total carbon emissions data used by the index include direct and first-tier indirect emissions. Direct emissions refer to the CO_2e emissions from directly emitting point sources such as fossil fuel combustion, industrial processes, and other sources owned or controlled by the company. First-tier indirect emissions refer to CO_2e emissions from direct suppliers such as electricity, business travel, and logistics providers.

Carbon emissions data is provided by S&P Trucost Limited (Trucost).

Carbon Intensity

Constituents within Trucost's coverage universe are assigned an annual carbon-to-revenue footprint prior to the annual rebalancing reference date. The carbon-to-revenue footprint metric is calculated by Trucost and is defined as a company's annual GHG emissions (direct and first tier indirect), expressed as metric tons of carbon dioxide equivalent (tCO_2e) emissions, divided by annual revenues for the corresponding year, expressed in millions of U.S. dollars.

At each annual rebalancing, the latest available carbon-to-revenue footprint data with a Trucost financial year of less than four years prior to the rebalancing reference date's year are used. Any carbon-to-revenue footprint data with a Trucost financial year of four years or more prior to the rebalancing reference date's year are considered as not covered.

For more information on Trucost's research process, please refer to *Appendix A.*

Constituent Weighting

At each rebalancing, constituents' weights are derived from the underlying index weights using re-weighting adjustments based on a bond's overall carbon quantile rank and effective duration, as elaborated in Exhibit 1:

Exhibit 1: Index Constituent Weight Adjustments

Constituent Market Value in Carbon Efficient Fixed Income Index	=	*Constituent Market Value in S&P 500 Investment Grade Corporate Bond Index*	*x*	*Issue Carbon Weight Adjustment Factor*	*x*	*Issue Effective Duration Adjustment Factor*

Step 1: Rank Sector Carbon Emissions

At each rebalancing reference date, GICS sectors are classified into quantile groups of 1, 2, and 3 (low, mid, and high-carbon emissions respectively) based on total absolute direct and first tier indirect greenhouse gas emission (tCO_2e) in that sector. A lower score equates to less carbon emission.

Sectors are classified as follows:

- **Low-Carbon (1)** = The four GICS Sectors with the least absolute GHG emissions
- **High-Carbon (3)** = The three GICS Sectors with the most absolute GHG emissions
- **Mid-Carbon (2**) = All remaining GICS Sectors

Step 2: Rank Issuer Carbon Intensity

At each rebalancing reference date, bond issuers are classified into quantile groups of 1, 2, and 3 (low-, mid- and high-carbon intensity respectively) based on the carbon-to-revenues footprint of each issuer within each sector. A lower score equates to lower carbon intensity.

Issuers are classified as follows:

1. Quantile thresholds are calculated for each GICS Sector by multiplying the issuer count in each sector by one-third (the *1^{st}-2^{nd} quantile threshold*) and by two-thirds (the *2^{nd}-3^{rd} quantile threshold).* Quantile thresholds are not rounded.
2. Issuers are ranked within their GICS Sector by their carbon efficiency using their Carbon-to-Revenue Footprint (a rank of 1 represents the company with the lowest carbon intensity).
3. Issuers are classified as having low-, mid- or high-carbon intensities using their rank:
    - **Low-Carbon (1)** = Issuer's rank < *1^{st}-2^{nd} quantile threshold*;
    - **Mid-Carbon (2)** = *1^{st}-2^{nd} quantile threshold* < Issuer's rank < *2^{nd}-3^{rd} quantile threshold;*
    - **High-Carbon (3)** = Issuer's rank > *2^{nd}-3^{rd} quantile threshold*

Step 3: Determine the Carbon Weight Adjustment Factor

Sector rank and issuer rank classifications are used to determine the overall *Carbon Weight Adjustment Factor,* as shown in Table 1. Underlying index weights are to be adjusted using the Carbon Weight Adjustment Factor. All bonds issued by issuers (with the exception of green bonds) are adjusted using the same Carbon Weight Adjustment Factor. Bonds with the highest carbon efficiency are overweighted by 35% (with a weight adjustment factor of 1.35), and bonds with the least carbon efficiency are underweighted by 35% (with a weight adjustment factor of 0.65). All adjustments are listed below.

Table 1: Carbon Weight Adjustment Factors

		Sector Ranking Classification		
		High-Carbon	Mid-Carbon	Low-Carbon
		3	2	1
Issuer Ranking Classification	3	0.65	0.75	1.15
	2	0.75	1.00	1.25
	1	0.85	1.25	1.35

Bonds from companies outside Trucost's coverage universe receives a Carbon Weight Adjustment Factor based on its sector classification and an assumed low issuer carbon classification.

Step 4: Green Bond Handling

Green bonds are considered the most carbon efficient and receive sector and issuer ranking classifications of 1. Green bonds are bonds in the underlying index that are also constituents of the S&P Green Bond Index as of the announced index composition on the rebalance reference date.

For more information on the S&P Green Bond index, please refer to the S&P Green Bond Indices Methodology document available at www.spglobal.com/spdji/.

Step 5: Duration Weight Adjustment

In consideration of future carbon pricing risk, a bond with a lower effective duration is overweighted, while a bond with a higher effective duration is underweighted, as defined below:

Effective Duration (years)	Category	Duration Adjustment Factor
0 – 3.5	Short	1.1
3.5 – 7.0	Standard	1.05
7.0 – 15.0	Intermediate	0.95
15.0 +	Long	0.90

Index Calculations

The underlying index is market value-weighted, except where otherwise noted.

The total return is calculated by aggregating the interest return, reflecting the return due to paid and accrued interest, and price return, reflecting the gains or losses due to changes in the end-of-day price and principal repayments.

For further details regarding index calculations, please refer to S&P Dow Jones Indices' Fixed Income Index Mathematics Methodology.

Index Maintenance

Rebalancing

Indices are reviewed and rebalanced in accordance with their stated schedule.

The index follows the rebalancing schedule of the underlying index. For the S&P 500 Investment Grade Corporate Bond Index, the security universe reference date is three business days prior to the last business day of the month[1]. On this date, the composition of the S&P 500 is observed. All outstanding investment grade bond issuances associated with these companies and their subsidiaries are then used to construct the starting universe for the S&P 500 Investment Grade Corporate Bond Index.

The descriptive data reference date is four business days prior to the last business day of the month. Terms and conditions data as of this date is used to determine which securities in the starting universe are eligible for the following month's composition.[2] For indices which use an additional weight factor (AWF) to modify index weights, all AWFs for the upcoming composition are set on the descriptive data reference date.

Additions, deletions, and other changes to the index arising from the rebalancing are made provided the security's reference information and pricing are available by designated pricing and data providers on the rebalancing reference dates. Changes to the index are published on the announcement date and become effective on the rebalancing date. Information related to the rebalancing is obtained and disseminated after the close of business.

Rebalancing Schedule	
Rebalancing Frequency	Monthly
Rebalance Date	Last day of the rebalancing period (*T*)
Announcement Date	*T* minus 3
Security Universe Reference Date	*T* minus 3
Descriptive Data Reference Date	*T* minus 3

All days reflect after the close and count business days

Deletions

If an index constituent is removed from an underlying index, it is also removed from the respective Carbon Efficient Index and not replaced.

A constituent flagged by S&P Global's MSA may also be removed if the Index Committee determines that the company in question is no longer eligible for index inclusion.

[1] The security universe reference date for history prior to the launch date was the last business day of each month. Effective with the index launch, the security universe reference date was six business days prior to the last business day of each month. Currently, the index uses three business days prior to the last business day of each month. Refer to Appendix B.

[2] Terms and conditions data and pricing are subject to WMR data availability.

Controversies: Media and Stakeholder Analysis Overlay

In addition to the above, S&P Global uses RepRisk for daily filtering, screening, and analysis of ESG risk incidents and controversial activities related to companies within the indices[3].

In cases where risks are presented, S&P Global releases a Media and Stakeholder Analysis (MSA) which includes a range of issues such as economic crime and corruption, fraud, illegal commercial practices, human rights issues, labor disputes, workplace safety, catastrophic accidents, and environmental disasters.

The Index Committee will review constituents that have been flagged by S&P Global's MSA to evaluate the potential impact of controversial company activities on the composition of the indices. In the event that the Index Committee decides to remove a company in question, that company would not be eligible for re-entry into the index for one full calendar year, beginning with the subsequent rebalancing.

For more information on RepRisk, please refer to www.reprisk.com. This service is not considered a direct contribution to the index construction process.

Carbon Emissions and Carbon Intensity Updates

Each company's carbon emissions and intensity are researched annually by Trucost, approximately eight months following the company's fiscal year end. Carbon Emissions and Carbon Intensity are updated on an as-needed basis following corporate events (mergers and acquisitions, spin-offs, etc.) and underlying data point revisions. Any update to a company's Carbon Emissions and Intensity is applied at the subsequent rebalancing.

Currency of Calculation and Additional Index Return Series

The index is calculated in U.S. dollars.

Additional currency and currency hedged versions of the indices, as well as maturity, sector and rating-based sub-indices, may be available. For a list of available sub-indices and tickers, please refer to S&P Dow Jones Indices' Fixed Income Index Directory available at www.spglobal.com/spdji/.

For more information on currency and currency hedged indices, please refer to S&P Dow Jones Indices' Fixed Income Index Mathematics Methodology.

Ongoing Maintenance

For more information on treatment of defaults or lack of daily price data, please refer to the Defaults section of S&P Dow Jones Indices' Fixed Income Policies & Practices Methodology.

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 500 Bond Investment Grade Carbon Efficient Index	11/05/2018	08/31/2015	08/31/2015	100

[3] RepRisk, an ESG data science company, leverages the combination of AI and machine learning with human intelligence to systematically analyze public information in 23 languages and identify material ESG risks. With daily data updates across 100+ ESG risk factors, RepRisk provides consistent, timely, and actionable data for risk management and ESG integration across a company's operations, business relationships, and investments.

Index Governance

Index Committee

An S&P Dow Jones Indices Index Committee maintains the indices. All committee members are full-time professionals at S&P Dow Jones Indices. Meetings are held regularly. The Index Committee oversees the management of the indices, including determinations of intra-rebalancing changes, maintenance and inclusion policies, and other matters affecting the maintenance and calculation of the indices.

In fulfilling its responsibilities, the Index Committee has full and complete discretion to (i) amend, apply, or exempt the application of index rules and policies as circumstances may require and (ii) add, remove, or by-pass any bond in determining the composition of an index.

The Index Committee may rely on any information or documentation submitted to it or gathered by it that the Index Committee believes to be accurate. The Index Committee reserves the right to reinterpret publicly available information and to make changes to the indices based on a new interpretation of that information at its sole discretion. All Index Committee discussions are confidential.

The Index Committee is separate from and independent of other analytical groups at S&P Global. In particular, the Index Committee has no access to or influence on decisions by S&P Global Ratings analysts.

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' Fixed Income Policies & Practices document.

Index Policy

Announcements

Announcements of any relevant information pertaining to the indices are made after market close. Press releases are posted on the S&P Dow Jones Indices Web site at *www.spglobal.com/spdji/*.

Holiday Schedule

The indices are calculated when the Securities Industry and Financial Markets Association (SIFMA®) declares the U.S. fixed income markets to be open.

A complete holiday schedule for the year is 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.

End-of-Day Calculation

Index levels are calculated at the end of each business day, via S&P Dow Jones Indices' Web site. This may be subject to change.

Index Releases

Releases are issued by S&P Dow Jones Indices at the end of the business day.

Recalculation Policy

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

Real-Time Calculation

Real-time, intra-day, index calculations are executed for the S&P 500 Bond Index and S&P 500 Investment Grade Corporate Bond Index when the U.S. bond market is open. Real-time calculations are based on WMR best bid pricing and incorporate data from MarketAxess. At its sole discretion, S&P Dow Jones Indices may change its data sources for real-time calculations or may cease publishing real-time index values. 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' Fixed Income 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.

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

Trucost Environmental Register Research Process

1. **Map company business segments.** Trucost maps company business segments to more than 450 business activities in the Trucost model. The model is based on the North American Industry Classification System (NAICS), but goes into greater granularity in some areas, such as power generating utilities.
2. **Estimate data-modelled profile.** Once company business segments have been mapped to Trucost sectors and their share of revenue apportioned to each, Trucost is able to efficiently generate a data-modelled profile for the company. Trucost uses its environmentally extended input-output (EEIO) model to estimate data for over 800 environmental and operational metrics across the entire operations of companies, from the raw materials they depend on in their supply chains to the electricity they purchase to power their operations.
3. **Collect public disclosure.** Trucost searches for environmental performance information in annual reports, sustainability reports, websites, and other publicly disclosed sources. Third-party datasets, like disclosures to the CDP[4] , are also reviewed. Trucost then standardizes reported environmental performance data to best practice guidelines so that it can be compared across companies, regions, and business activities. To correct errors in company reporting, data control procedures are applied, including sector specialist data reviews, automated outlier identifications and year-on-year comparisons. Wherever a material metric is not disclosed, Trucost uses the modelled value to estimate the missing data fields.
4. **Engage with company.** Trucost then conducts an annual engagement with each company, providing the opportunity to verify environmental performance and provide additional information. Companies are further welcomed to contact Trucost analysts at any point in their environmental reporting cycle to provide their most recently available data. This supports Trucost's efforts to utilize the most up-to-date company information and to maximize data quality.
5. **Greenhouse Gas Emissions Data.** The indices use Trucost's greenhouse gas emissions data set. Quantities of greenhouse gas emissions are normalized by sales to calculate the company's carbon intensity, or "carbon-to-revenue footprint". The indices use direct and first-tier indirect emissions in the determination of the carbon-to-revenue footprints. For more information on these emissions scopes, and more, please refer to the *Trucost FAQ*.

For more information on Trucost, please refer to www.trucost.com.[5]

[4] CDP is a not-for-profit charity that surveys companies on Climate, Water, and Forestry issues and aggregates the collected disclosures. For more information see: https://www.cdp.net/.

[5] For more information on the Trucost Environmental dataset, please refer to https://www.marketplace.spglobal.com/en/datasets/trucost-environmental-(46). For more information on Trucost's research process, please refer to the Trucost Environmental Data Methodology Guide.

Appendix B

Methodology Changes

Methodology changes since January 1, 2015 are as follows:

Change	Effective Date (After Close)	Methodology Previous	Updated
Debt-to-Equity Mapping Logic	04/30/2021	The index universe consists of debt issued in the U.S. by companies (and their subsidiaries) in the S&P 500. This starting universe is determined from data obtained from FactSet or Refinitiv. Descriptive data used to determine bond eligibility is sourced from Refinitiv.	The index universe consists of debt issued in the U.S. by companies (and their subsidiaries) in the S&P 500. The starting universe and descriptive data used to determine bond eligibility is sourced from Refinitiv.
Reference Date	04/30/2021	For the S&P 500 Bond Index and related sub-indices, the security universe reference date is six business days prior to the last business day of the month. On this date, the composition of the reference equity index is observed. All outstanding bond issuances associated with these companies and their subsidiaries are then used to construct the starting universe for the S&P 500 Bond Index. The descriptive data reference date is four business days prior to the last business day of the month. Terms and conditions data as of this date is used to determine which securities in the starting universe are eligible for the following month's composition. For indices which use an additional weight factor (AWF) to modify index weights, all AWFs for the upcoming composition are set on the descriptive data reference date.	For the S&P 500 Bond Index and related sub-indices, the security universe and descriptive data reference date is three business days prior to the last business day of the month. On the reference date the composition of the reference equity index is observed, and all outstanding bond issuances associated with these companies, and their subsidiaries, form the starting universe for the index. Terms and conditions data as of the reference date is used to determine which securities in the starting universe are eligible for the following month's composition. Indices employing an additional weight factor (AWF) to modify index weights set AWFs for the upcoming composition on the reference date.
Rebalancing Reference Date	03/29/2019	The rebalancing reference date is three days prior to market close of the last business day of the previous month (t-3).	The rebalancing reference date is four days prior to market close of the last business day of the previous month (t-4).

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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