
Construction Rules for the Morningstar[®] Low Carbon Risk IndexSM Family

Morningstar Indexes

April 2020

Contents

- 1 **Overview**
- 2 **Index Construction**
 - 2.1 Assigning Stocks to the Index
 - 2.2 Index Weighting
- 3 **Index Maintenance and Calculation**
 - 3.1 Index Maintenance and Corporate Action Treatment
 - 3.2 Index Calculation and Price Data
- 4 **Methodology Review and Index Cessation Policy**
- 5 **Data Correction and Precision**
 - 5.1 Intraday Index Data Corrections
 - 5.2 Index-Related Data and Divisor Corrections
 - 5.3 Computational and Reporting Precision
- 6 **Appendixes**
 - 6.1 Glossary
 - 6.2 Security Carbon Risk Score
 - 6.3 Portfolio Carbon Risk Score and Fossil Fuel involvement
 - 6.4 Index Inception Date & Performance Inception Date
 - 6.5 Modification to Rulebook
 - 6.6 Weighting Methodology
- 7 **About Morningstar**

Overview

The Morningstar Low Carbon Risk IndexSM family is designed to provide exposure to companies that are aligned with the transition to a low-carbon economy, within the large- and mid-cap segment of their respective parent indices. Each index targets a low carbon risk score and low exposure to fossil fuels at portfolio level, while ensuring that the portfolio is diversified across sectors and regions and minimizing portfolio active risk with respect to the parent benchmark.

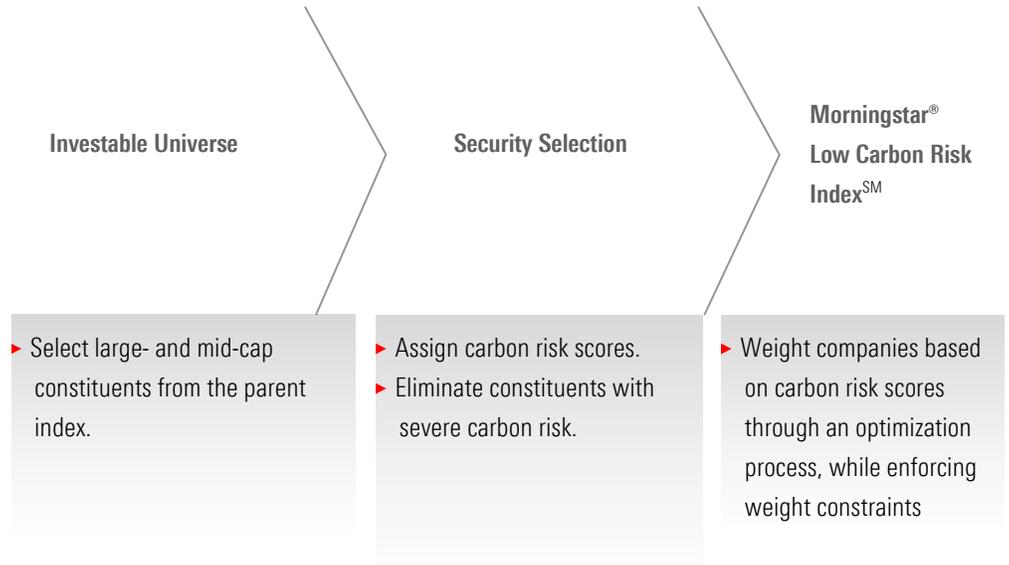
To assess the carbon risk of a company, Morningstar uses the carbon risk scoring from Sustainalytics. For more information on the Sustainalytics Security Carbon Risk score, please refer to Appendix 2.

Index Inception Date and Performance Inception Date

For inception and performance inception date of the Low Carbon Risk Index series, refer to Appendix 4.

Index Construction

Exhibit 1 Morningstar Low Carbon Risk Index Construction Process



For additional details, refer to the "Assigning Stocks to the Index" section.

Assigning Stocks to the Index

Selection Universe

At each reconstitution, securities for each Morningstar Low Carbon Risk Index are derived from its respective parent large-mid cap index (the benchmark). Securities with severe carbon risk are excluded from the indexes.

Optimization Parameters

At every reconstitution, the Morningstar Low Carbon Risk Indexes are created using an optimizer such that it meets the following objectives and constraints.

- ▶ Minimize the ex-ante tracking error of the portfolio with respect to the benchmark.
- ▶ The portfolio carbon risk score should be less than or equal to 9.5. For details on the portfolio carbon risk score, refer to Appendix 3.
- ▶ The portfolio fossil fuel involvement should be less than 6.5% of assets.
- ▶ The maximum weight of a security is restricted to 5 times its weight in the benchmark.
- ▶ The maximum weight of a security should be less than or equal to 10%.
- ▶ The maximum one-way turnover should be less than 10%.
- ▶ Regional active weight constraints: To minimize deviation from corresponding weights in the parent index, the regional weights in the index are maintained within a lower and upper bound, calculated as:
 - ▶ Lower bound = $\text{Max}(\text{Weight in the benchmark} - 4\%, \text{Weight in the benchmark} / 4)$
 - ▶ Upper bound = $\text{Min}(\text{Weight in the benchmark} + 4\%, \text{Weight in the benchmark} * 4)$
- ▶ Sector active weight constraints: To minimize deviation from corresponding weights in the parent index, the sector weights in the index are maintained within a lower and upper bound, calculated as:
 - ▶ Lower bound = $\text{Max}(\text{Weight in the benchmark} - 4\%, \text{Weight in the benchmark} / 4)$
 - ▶ Upper bound = $\text{Min}(\text{Weight in the benchmark} + 4\%, \text{Weight in the benchmark} * 4)$

Securities are removed from the final portfolio if the optimization process yields negligible weights (that is, less than 0.01%). This residual weight is redistributed among remaining securities in the portfolio.

For more details, please refer to Appendix 6.

Number of Stocks

The number of stocks in a portfolio is variable and depends on the minimization objectives and constraints described in the "Optimization Parameters" section.

Index Weighting

The weights of index constituents are determined through an optimization process subject to the objective function and weight constraints described in the "Optimization Parameters" section. For more details, please refer to Appendix 6.

Index Maintenance and Calculation

Scheduled Maintenance

The indexes are rebalanced quarterly in March, June, September, and December and reconstituted semiannually in June and December. Rebalancing and reconstitution are implemented after the close of business on the third Friday of March, June, September, and December and effective the following Monday. If Monday is a holiday, they are effective on the next following business day.

The carbon risk score data used for reconstitution is the latest available data as of the last trading day of May and November.

Corporate Action

The treatment of corporate actions can be found in the [Morningstar Indexes Corporate Actions Methodology rulebook](#).

Index Calculation and Price Data

Details about index calculations and price data can be found in their respective rulebooks: [Morningstar Indexes Calculation Methodology](#) and [Equity Closing Prices Used for Index Calculation](#).

Methodology Review and Index Cessation Policy

The index methodology is continually reviewed to ensure it achieves all stated objectives. These reviews take into account corporate action treatment, selection, and maintenance procedures. Subscribers to the index will be notified before any methodology changes are made. For more details, refer to the [Morningstar Index Methodology Change Process](#).

Morningstar also notifies all subscribers and stakeholders of the index that circumstances might arise that require a material change to the index, or a possible cessation of the index. Circumstances that could lead to an index cessation include, but are not limited to, market structure change, product definition change, inadequate supply of data, insufficient revenue associated with the index, insufficient number of clients using the index, and/or other external factors beyond the control of the Morningstar Index Committee.

Because the cessation of the index or benchmark index could disrupt subscriber products that reference this index, all subscribers are encouraged to have robust fallback procedures if an index is terminated. For more details, refer to the [Morningstar Index Cessation Process](#).

Data Correction and Precision

Intraday Index Data Corrections

Commercially reasonable efforts are made to ensure the accuracy of data used in real-time index calculations. If incorrect price or corporate action data affect index daily highs or lows, they are corrected retroactively as soon as is feasible.

Index-Related Data and Divisor Corrections

Incorrect pricing and corporate action data for individual issues in the database will be corrected upon detection. In addition, an incorrect divisor of an index, if discovered within five days of its occurrence, will always be fixed retroactively on the day it is discovered to prevent an error from being carried forward. Commercially reasonable efforts are made to correct an older error subject to its significance and feasibility.

For more details, refer to the [Recalculation Guidelines](#).

Computational and Reporting Precision

For reporting purposes, index values are rounded to two decimal places and divisors are rounded to appropriate decimal places.

Appendixes

Appendix 1: Glossary

| Terms | Description |
|-----------------------|---|
| Reconstitution | During each reconstitution, the steps mentioned in the index construction process are performed, resulting in membership reset. |
| Rebalance | During each rebalancing, the weights are adjusted for updated free-float and shares outstanding data. |

Appendix 2: Security Carbon Risk Score

Sustainalytics' assessment of a security's carbon risk is based on:

- ▶ The firm's exposure to carbon-related risks throughout the value chain.
- ▶ Sustainalytics' view on the degree to which the firm's activities and products will be targeted for alignment with a low-carbon economy.
- ▶ The firm's ability to manage and reduce carbon risks, and the quality of its approach.

Scores range from 0 to 100, where lower scores are better, indicating lower carbon risk. Scores may be interpreted as follows, both for Sustainalytics company ratings and Morningstar portfolio scores:

| Score | Carbon Risk Level | Description |
|------------|-------------------|---|
| 0 | Negligible | The company has little to no material risk in a low-carbon economy. |
| >0 - 9.99 | Low | The company has carbon risk that could have material impact if not managed properly. |
| 10-29.99 | Medium | The company has carbon risk that is material and if not addressed will make it an underperformer in the market. |
| 30 - 49.99 | High | The company has carbon risk that is highly material and if not addressed will make it a laggard in the market. |
| > 50 | Severe | The company is unlikely to survive in a low-carbon economy. |

Appendix 3: Portfolio Carbon Risk and Fossil Fuel Involvement

Portfolio Carbon Risk Score

The Morningstar Portfolio Carbon Risk Score is the asset-weighted carbon risk score of the equity or corporate-bond holdings in a portfolio (long positions only), averaged over the trailing 12 months. To calculate the portfolio carbon risk scores, Morningstar uses Sustainalytics' company carbon risk ratings, which indicate the risk that companies face from the transition to a low-carbon economy.

$$\text{Morningstar Portfolio Carbon Risk Score} = \sum w_i * CCRR$$

Where:

W_i = asset weight of security i

CCRR = Company Carbon Risk Rating

Portfolio Fossil Fuel Involvement

Morningstar Portfolio Fossil Fuel Involvement is the portfolio's percentage exposure to fossil fuels, averaged over the trailing 12 months. Companies involved with fossil fuels are defined as those deriving at least 5% of their revenue from the following activities: thermal coal extraction, thermal coal power generation, oil and gas production, and oil and gas power generation. Companies deriving at least 50% of their revenue from oil and gas products and services are also included.

Appendix 4: Index Inception Date and Performance Inception Date

| Index Name | Performance Inception Date | Inception Date |
|---|----------------------------|----------------|
| Morningstar Global Markets Low Carbon Risk Index | 12/21/2012 | 12/4/2018 |
| Morningstar Developed Markets Low Carbon Risk Index | 12/21/2012 | 12/4/2018 |
| Morningstar Global Markets ex-US Low Carbon Risk Index | 12/21/2012 | 12/4/2018 |
| Morningstar Developed Markets ex-US Low Carbon Risk Index | 12/21/2012 | 12/4/2018 |
| Morningstar Developed Europe Low Carbon Risk Index | 12/21/2012 | 12/4/2018 |
| Morningstar Emerging Markets Low Carbon Risk Index | 12/21/2012 | 12/4/2018 |
| Morningstar US Market Low Carbon Risk Index | 12/21/2012 | 12/4/2018 |
| Morningstar Asia ex-Japan Low Carbon Risk Index | 12/21/2012 | 12/4/2018 |
| Morningstar Nordic Low Carbon Risk Index | 12/21/2012 | 12/4/2018 |
| Morningstar Japan Low Carbon Risk Index | 12/21/2012 | 12/4/2018 |

Appendix 5: Morningstar Regions and Sectors

The following regions and sectors are considered while applying the active sector/region constraints:

- ▶ Regions
 - ▶ Developed Markets Americas
 - ▶ Developed Markets Europe and Middle East

- ▶ Developed Markets Asia Pacific
 - ▶ Emerging Markets Asia
 - ▶ Emerging Markets Europe
 - ▶ Emerging Markets Americas
 - ▶ Emerging Markets Middle East and Africa
- ▶ Sectors
- ▶ Basic Materials
 - ▶ Communication Services
 - ▶ Consumer Cyclical
 - ▶ Consumer Defensive
 - ▶ Energy
 - ▶ Financial Services
 - ▶ Healthcare
 - ▶ Industrials
 - ▶ Real Estate
 - ▶ Technology
 - ▶ Utilities

Appendix 6: Weighting Methodology

PCA Covariance Matrix: A covariance matrix is created based on a principal component analysis using weekly U.S.-dollar returns of benchmark securities over the last five years. At least 10% of total weekly returns data (six months of weekly returns) should be available for a security. Otherwise, the security is dropped from the covariance matrix as well as the final portfolio. Only the top N principal components are taken that can explain at least 50% of the total variance.

The security returns are first winsorized at the level of 98%. The weekly returns are then exponentially weighted such that the decay factor is equivalent to the following calculation:

$$\lambda = e^{-\left(\frac{1}{n}\right)}$$

This results in half-life equal to $n \ln 2$.

Where: n is the number of observations

Objective Function:

$$\text{minimize } \sigma_{PA}^2 = \sum_i \sum_j w_{PA,i}^T C_{i,j} w_{PA,i}$$

Subject to:

$$\sum_i w_{P,i} = 1$$

$$\sum_i w_{p,i} cr_i \leq 9.5$$

$$\sum_i w_{p,i} f_i \leq 6.5\%$$

$$w_{p,i} \leq \min(10\%, 5w_{b,i})$$

$$\sum_i (\max(0, (w_{p,i,t} - w_{p,i,t-1})) \leq 10\%$$

$$\max \left[\left(\sum_{i \in S(j)} w_{b,i} \right) - 4\%, \frac{(\sum_{i \in S(j)} w_{b,i})}{4} \right] \leq \sum_{i \in S(j)} w_{p,i} \leq \min \left[\left(\sum_{i \in S(j)} w_{b,i} \right) + 4\%, \left(\sum_{i \in S(j)} w_{b,i} \right) \times 4 \right]$$

$$\max \left[\left(\sum_{i \in R(k)} w_{b,i} \right) - 4\%, \frac{(\sum_{i \in R(k)} w_{b,i})}{4} \right] \leq \sum_{i \in R(k)} w_{p,i} \leq \min \left[\left(\sum_{i \in R(k)} w_{b,i} \right) + 4\%, \left(\sum_{i \in R(k)} w_{b,i} \right) \times 4 \right]$$

Where:

$w_{PA,i} = w_{p,i} - w_{b,i}$

$w_{p,i}$ = Optimized weight of security i

$w_{b,i}$ = Weight of security i in the benchmark

C_{ij} = Covariance matrix created using PCA components

cr_i = Carbon Risk score of security i

f_i = Fossil fuel involvement of security i, either 1 or 0

$S(j)$ = Sector set

$R(k)$ = Region set

σ_{PA}^2 = Tracking error of the portfolio

$w_{p,i,t-1}$ = Weight of security i in the portfolio prior to the reconstitution

Constraints will be relaxed if a feasible solution is not obtained. The relaxation happens in the following order:

- ▶ Sector/region constraints are relaxed from +/-4% to +/-5%
- ▶ Sector/region constraints are relaxed from +/-5% to +/-6%
- ▶ One-way turnover constraint is relaxed from 10% to 15%

Securities are removed from the final portfolio if the feasible solution yields negligible weights (less than 0.01%). This residual weight is redistributed among remaining securities in the portfolio.

About Morningstar, Inc.

Morningstar, Inc. is a leading provider of independent investment research in North America, Europe, Australia, and Asia. Morningstar offers an extensive line of products and services for individual investors, financial advisors, asset managers, and retirement plan providers and sponsors. Morningstar provides data on approximately 510,000 investment offerings, including stocks, mutual funds, and similar vehicles, along with real-time global market data on more than 17 million equities, indexes, futures, options, commodities, and precious metals, in addition to foreign exchange and Treasury markets. Morningstar also offers investment management services through its investment advisory subsidiaries.

About Morningstar Indexes

Morningstar® Indexes combine the science and art of indexing to give investors a clearer view into the world's financial markets. Our indexes are based on transparent, rules-based methodologies that are thoroughly back-tested and supported by original research. Covering all major asset classes, our indexes originate from the Morningstar Investment Research Ecosystem—our network of accomplished analysts and researchers working to interpret and improve the investment landscape. Clients such as exchange-traded fund providers and other asset management firms work with our team of experts to create distinct, investor-focused products based on our indexes. Morningstar Indexes also serve as a precise benchmarking resource.

Morningstar Index Product Committee

The Morningstar Index Product Committee is comprised of members who possess a wide array of knowledge in relation to Indexes. The Product Committee is responsible for the governance over the creation and maintenance of all Morningstar branded Indexes, ensuring the highest standards are continuously met. Any matters arising from exceptional or undocumented events will be resolved at the discretion of the Morningstar Index Product Committee.

Morningstar Index Oversight Committee

The Morningstar Index Oversight Committee is comprised of informed and qualified professionals who are responsible for the process governance of Morningstar branded Indexes. The Oversight Committee assesses and where appropriate challenges the decisions of Morningstar Indexes with regards to benchmark decisions.

For More Information

For any queries, reach out to us via our [communication page](#).



22 West Washington Street
Chicago, IL 60602 USA

©2020 Morningstar. All Rights Reserved.

The information in this document is the property of Morningstar, Inc. Reproduction or transcription by any means, in whole or part, without the prior written consent of Morningstar, Inc., is prohibited. While data contained in this report are gathered from reliable sources, accuracy and completeness cannot be guaranteed. All data, information, and opinions are subject to change without notice. This document may contain back-tested or simulated performances and the subsequent results achieved by the investment strategy may be materially different.