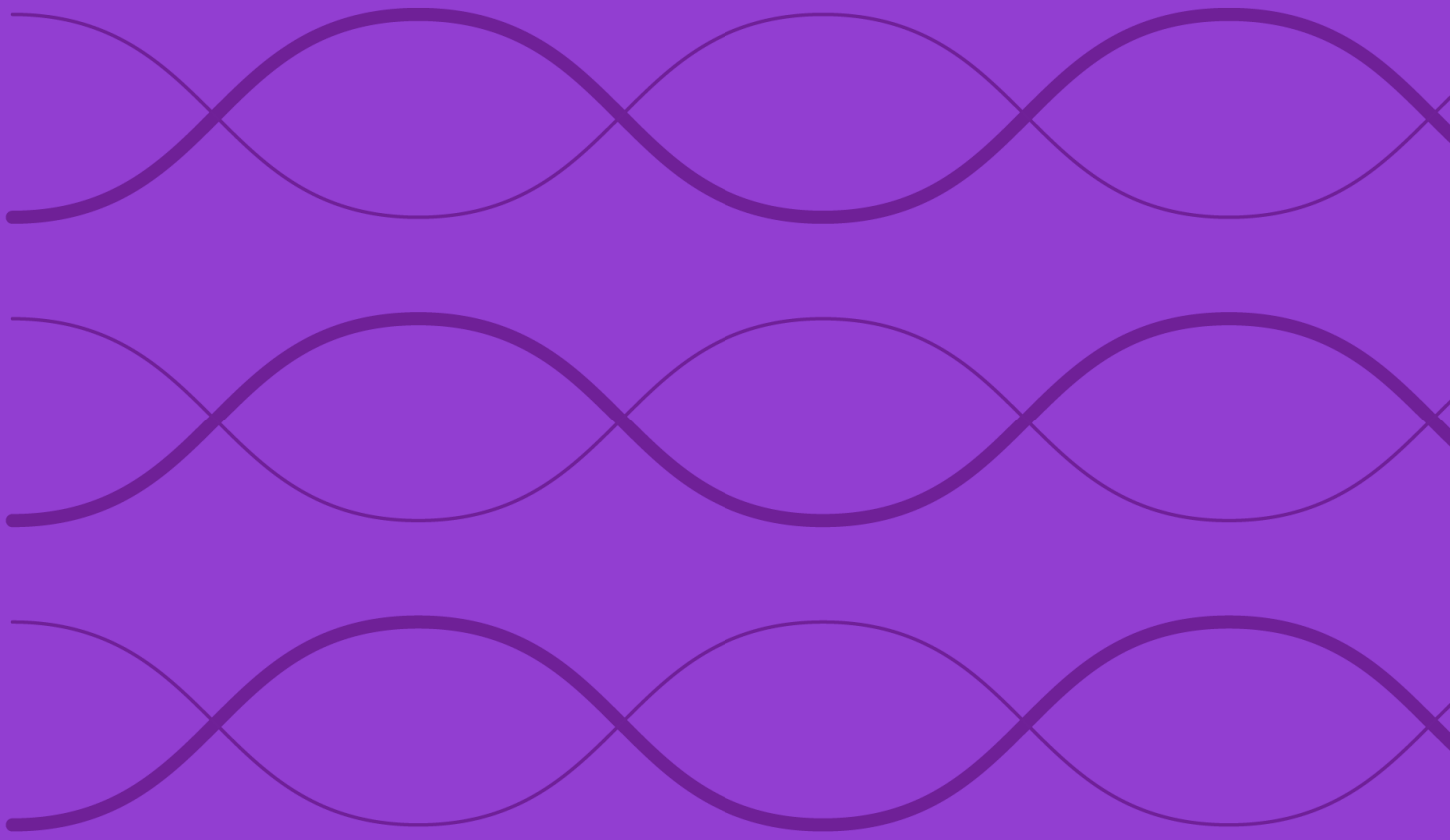
MORNINGSTAR Indexes

Construction Rules for the Morningstar Factor Tilt Indexes



May 2026

Overview

The Morningstar Factor Tilt Indexes measure the performance of global equity markets with increased exposure toward small-capitalization and value-oriented stocks. These stocks have an overweighting in the indexes compared with their weight in their corresponding parent benchmarks, which are free-float, market-capitalization-weighted indexes. Likewise, large-cap or growth stocks are underweighted relative to their weights in the standard market-capitalization-weighted parent benchmarks. The indexes seek to capture both a value and size premium to achieve what the efficient-market camp refers to as systematic exposure to undiversifiable risk.

These indexes do not incorporate Environmental, Social, or Governance (ESG) criteria.

Index Inception and Performance Start Date

The inception date and performance start date, when the first back-tested index values were calculated, are listed in Appendix 7.

Index Construction

Methodology

Starting Universe

- Appropriate regional benchmark the Morningstar Global Markets Indexes[1]
  - Represents 97% of the investable market

Eligibility

- Style score must be available.

Portfolio Construction

- Categorize stocks by market cap and style.
- Tilt the portfolio towards the small-cap and value stocks from the parent, while underweighting large-cap growth stocks.

Morningstar Factor Tilt Indexes

Starting Universe

At each reconstitution, securities for Morningstar US Market Factor Tilt Index are derived from the Morningstar US Market Extended Index, covering the top 99.5% of investable market capitalization. Similarly, at each reconstitution, securities for the Morningstar Emerging Markets and Morningstar Developed Markets ex-US Factor Tilt indexes are derived from the Morningstar Global Markets ex-US Index.

Eligibility

To be eligible for index inclusion, all constituents must meet the following criteria:

- To qualify for inclusion, each stock must have a valid style
- A stock's value orientation reflects the price investors are willing to pay for a share of some combination of the stock's prospective earnings, dividends, sales, cash flow, and book value.
- Value orientation is determined using the following three steps:
  - Calculate five prospective yields (earnings, dividend, cash flow, revenue, and book value) for each stock within each of the cap indexes.
  - Compute a cumulative value score for each security.
  - The total free-float market capitalization of a given size segment is divided equally among the three style segments.
- For complete rules on assigning value and style scores, refer to Appendix 3 and 4.

[1] See appendix 5 for parent benchmarks of each index in the family.

MORNINGSTAR Indexes

Portfolio Construction

Applying Factor Tilt

- The purpose of these indexes is to allow investors to tilt their equity exposure toward a particular investment style while maintaining a low-turnover core portfolio.[2]
- To arrive at the small-value tilt, the market is divided into four asymmetric quadrants. The value and size tilts are applied across the four quadrants, specifically overweighting the small-value quadrant relative to the other quadrants. With this approach, relative market weighting is maintained within each quadrant, resulting in a low-turnover core portfolio that captures long-term small-value premiums.
- For more details on tilt factor calculations, refer to Appendix 3.

Number of Stocks

The number of stocks in the index is variable, subject to the selection and eligibility criteria at the time of reconstitution.

Index Weighting

The indexes are tilt-weighted from float market capitalization weight based on the factor tilts described above. For more details, refer to Appendix 5 and the Morningstar Indexes Calculation Methodology rulebook.

[2] Style ranking and assignments are made at the company level, effective from the close of June 19, 2026, on.

Index Maintenance and Calculation

Scheduled Maintenance

The indexes are reconstituted, where the membership is reset, semi-annually on the third Friday of June and December. Adjustments are implemented after Friday's market close and reflected the following Monday. If Monday is an index holiday, reconstitution is reflected the next business day. The market data used for reconstitution is as of the last trading day of April and October.

The indexes are rebalanced quarterly on the third Friday of March, June, September, and December. Adjustments are implemented after Friday's market close and reflected the following Monday. If Monday is an index holiday, the rebalance is reflected the next business day. The market data used for rebalancing is as of the last trading day of February, May, August, and November.

Refer to Appendix 2 for details on reconstitution and rebalancing.

Index files are published according to the global calendar schedule, meaning index files will be published every day from Monday to Friday throughout the year, even on local market holidays.

Corporate Actions

The treatment of corporate actions will be as per the float market capitalization weighted indexes.
For more details, please refer to the "Treatment for float market capitalization indexes" section 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 Decommissioning 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 Policy.

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 Decommissioning Policy.

Data Correction

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 affects index calculations, corrections are applied prospectively.

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 two 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.

Exceptions

While Morningstar will seek to apply the methodology as described within this document, the market environment, supervisory, legal, financial, or tax reasons may require an alternative approach to be adopted. A decision to take an alternative approach will be made by the Morningstar Index Methodology Committee, and in all instances, the application of a nonstandard process will be reported to the Morningstar Index Oversight Committee.

Appendixes

Appendix 1: Modifications to the Rulebook

Section	Description of Change	Update Date
Entire rulebook	• Moved to new template	August 2023
Index Maintenance & Calculation	• Updated calendar to global for all indexes	February 2024
Data Correction and Precision	• Computational and Reporting Precision Section removed	June 2025
Appendix 3	• Updated Appendix 3	November 2025
Style Assignment	• Style ranking and assignments will be made at the company level effective after the close of June 19, 2026. Prior to this date, the assignments were made at the share class level.	May 2026
Appendix 3, 4,	• Updated methodology for outlier trimming, style metric standardization and weighted average growth rate calculations, which will be effective after the close of June 19, 2026.	May 2026

Appendix 2: Glossary

Terms	Description
Reconstitution	Each reconstitution involves the following: • Updating the global market investable equity universe. • Reviewing the economic segment- and country-level size segment breakpoints. • Assigning companies to capitalization bands taking into account the buffer zones. • Changes in index shares (free float, total shares outstanding, index-specific adjustment factor) of each constituent.
Rebalance	During each rebalancing, the following activities are undertaken: • Changes in index shares (free float, total shares outstanding, index-specific adjustment factor) of each constituent. • Addition of U.S. spin-offs/IPOs to the global markets index.
Free Float	The free float is defined as a security's outstanding shares adjusted by block ownership to reflect only truly tradable and investable shares. A security's outstanding shares are adjusted if an entity owns 5% or more of the security through one of the following types of block ownership: • Cross-ownership—shares that are owned by other companies (including banks and life insurance companies). • Government ownership—shares that are owned by governments (central or municipal) or their agencies. • Private ownership—shares that are owned by individuals or families. • Restricted shares—shares that cannot be traded during a certain time period. However, a security's outstanding shares are not adjusted for institutional investors' holdings, which include, but are not limited to, the following categories: • Custodian nominees • Trustee companies • Mutual funds • Investment companies • Pension fund holdings

Appendix 3: Measuring Stock Value Orientation

Value orientation is calculated within capitalization classes, or cap bands. That is, a stock is assigned to a cap band before its value orientation is determined. Two stocks that have similar financial ratios and growth prospects but are in different cap bands may be given different value assignments.

Terminology and Notation

The following short forms relate to the 5 metrics used to determine a stock's value score:

e1/p	=	prospective earnings yield (forecast earnings per share for the current fiscal year, divided by current price per share)
r1/p	=	prospective revenue yield
c1/p	=	prospective cash flow yield
d1/p	=	prospective dividend yield
b1/p	=	prospective book value yield

The following short forms relate to a company's fundamental data (earnings per share, for example):

e1	=	forecast earnings per share for the current fiscal year (the basis for the yield variable defined above).
e0	=	EPS for most recent fiscal year
e–1	=	EPS for the fiscal year prior to e0
e–2	=	EPS for the fiscal year prior to e–1
e–3	=	EPS for the fiscal year prior to e–2
e–4	=	EPS for the fiscal year prior to e–3

As needed to determine the stock's value score, the same notations are used for cash flow per share, revenue per share, book value per share, and dividends per share except that "c," "r," "b," or "d," respectively, are substituted for "e" in the example above.

Basic Process

A stock's value orientation reflects the price investors are willing to pay for a share of some combination of the stock's prospective earnings, dividends, sales, cash flow, and book value.

Value orientation is determined using the following three steps:

- Calculate up to five prospective yields (e1/p, d1/p, c1/p, r1/p, and b1/p) for each stock. These values are determined using the process described in the next section.
- Calculate a float market cap-weighted percentile score for each available yield factor, for each stock, within each cap band (large, mid, and small).

- Calculate a weighted average of the individual percentile scores for each stock, using the weighting scheme detailed in "Calculating Overall Value Orientation Scores" below. The weighted average score represents the strength of the stock's value orientation.

Details of each of these steps are provided below.

Calculating Prospective Yields

As many as possible of e1/p, d1/p, c1/p, r1/p, and b1/p are calculated for each stock. Because p is known, the method used to forecast e1, d1, and so on, is key.

If e1, c1, r1, or b1 is forecast to be negative, prospective yield on that factor is excluded for that stock. If no third-party forecast is available and e0, c0, r0, or b0 is positive, then forecast values are calculated as described below (using EPS as an example).

The relationship between prospective and current EPS is straightforward:

[1] $$e_1 = e_0 * (1 + g(e_1))$$

Because e_0 is known, only $g(e_1)$ must be calculated to provide a forecast of e_1. Also, $g(e_1)$ is calculated from historical earnings information.

First calculate as many as possible of four periodic growth rates:

[2] $$g(e)_{-4} = \left(\frac{e_0}{e_{-4}}\right)^{\frac{1}{4}} - 1$$

[3] $$g(e)_{-3} = \left(\frac{e_0}{e_{-3}}\right)^{\frac{1}{3}} - 1$$

[4] $$g(e)_{-2} = \left(\frac{e_0}{e_{-2}}\right)^{\frac{1}{2}} - 1$$

[5] $$g(e)_{-1} = \left(\frac{e_0}{e_{-1}}\right)^{1} - 1$$

Where e-1, e-2, e-3, or e-4 is negative, no growth rate is calculated using that data point. Availability for restated cash flow is limited to three years.

When as many as possible of the growth rates defined above have been calculated, average the results:

[6] $$g(e)_1 = \text{Average}\left[g(e)_{-4}, g(e)_{-3,}, g(e)_{-2}, g(e)_{-1}\right]$$

Thus:

- Estimated earnings growth g(e1) and forecast earnings (e1) are calculated only for stocks where e0 is a positive number.

- In calculating g(e1), recent growth rates are included in more of the averaged terms than are older growth rates; recent growth rates are therefore weighted more heavily than are older growth rates.
- If third-party forecasts are unavailable, e1/p, c1/p, r1/p, and b1/p are calculated in the same way.

The prospective dividend is determined based on the stock's most recent dividend and published frequency:

$$d_1 = d_0 * f_0$$

If d1/p is the only available forecast yield figure, the stock is not given a VCG assignment.

For financial services stocks, the cash flow yield is not used in the value factor calculation.

Calculating Percentile Scores for Each Value Factor

When one or more of e1/p, d1/p, c1/p, r1/p, and b1/p values have been calculated, with or without d1/p, each stock is assigned a float-weighted percentile score for each relevant factor. The percentile scores are calculated within the stock's cap.

Prospective earnings yield scores for large-capitalization stocks are used in the following example.

To calculate an earnings yield score for each stock in the large cap:

- Order all stocks in the large cap by their e1/p scores.
- Calculate the float-weighted trimmed mean e1/p for all stocks in the large cap band.
- If all the stocks are within 3 weighted standard deviations of the weighted mean, no stocks are trimmed.
- If not, trim all stocks that are outside 3 weighted standard deviations outside the weighted median. View Appendix 5 for the trimming algorithm.
- Recalculate the float-weighted average e1/p for the cap band and then calculate the percentile score for each factor according to the following equation:

$$F_i = 50 * (1 + \frac{Xi - \mu}{3\sigma})$$

Where:

F_i = Percentile score for individual factor
X_i = Stock factor value
μ = Float market-cap-weighted factor average
σ = Float market-cap-weighted factor standard deviation

- Trimmed stocks are then added back into the cap band and receive the score of lowest- and highest-scoring non trimmed stocks.

All of the steps in this section are then repeated for each of c1/p, r1/p, and b1/p, and d1/p.

Calculating Overall Value Orientation Scores

When the steps above are complete for each of the five value factors, a weighted average is calculated for each stock. In calculating the weighted average, e/p scores, if available, are assigned a weight of 50%; each of the other value factors is assigned an equal share of the remaining weight (either 50% or, if e/p is unavailable, 100%). The weighted average result is the stock's overall value orientation score.

Appendix 4: Trimming Algorithm

The following describes the processes related to calculating percentile scores for each of the 5 factors:

- Test whether trimming should be applied to datasets for individual factors.
- If so, determine what values to trim.

w_i' is calculated as: $w_i' = \frac{w_i}{\sum_{j \in \Omega} w_j}$

We define the following statistics,

Weighted mean: $\mu = \sum_{i \epsilon \Omega} w_i' x_i$

Weighted standard deviation: $\sigma = \sqrt{\sum_{i \epsilon \Omega} w_i' (x_i - \mu)^2}$

Minimum and maximum: $\text{Min}[x] = \text{Min}\{x_i \mid i \in \Omega\}$
$\text{Max}[x] = \text{Max}\{x_i \mid i \in \Omega\}$

Where:

N = the number of securities
x_i = the variable in the question for security i
w_i = the float market cap weight of security i for the full set of N securities within the cap band
Ω = the set of securities that have not been trimmed
$\bar{\Omega}$ = the set of securities that have been trimmed
w_i' = the float market cap weight of security i for Ω

Weighted Median

To calculate the weighted median:

- Sort the values of x_i $i \in \Omega$ from lowest to highest. Let M = the number of elements of Ω. Let (m) denote the index for the m^{th} lowest value of x_i so that $x_{(1)} \leqslant x_{(2)} \leqslant \cdots \leqslant x_{(M)}$.
- Find the smallest value of m* such that $\sum_{m=1}^{m*} w'_{(m)} \geq \frac{1}{2}$
- The median is Med Med[x] = $x_{(m*)}$

Weight in Untrimmed Set

$$p = \sum_{i \in \Omega} w_i$$

We set a threshold for p, p*=0.95

The Algorithm:

1. Set $\Omega = \{1,2,...,N\}$ and $\bar{\Omega} = \Phi$.
2. Calculate μ, σ, Min[x], Max[x], Med[x], and p.
3. If (Min[x] $\geqslant \mu - 3\sigma$ and Max[x] $\leqslant \mu + 3\sigma$) or p $\leqslant$ p*, go to step 6.
4. For each i $\in \Omega$, if x_i < Med[x] - 3σ or x_i > Med[x] + 3σ, move i from $\bar{\Omega}$ to Ω.
5. Go to step 2.
6. For each $i \in \bar{\Omega}$, for replace any x_i < Min[x] with Min[x], and any x_i > Max[x] with Max[x].

Calculating the Score

Using the values of μ and σ from the final interation of the algorithm, the score of each stock is:

$$S_i = 50 * (1 + \frac{Xi - \mu}{3\sigma})$$

Appendix 5: Assigning Stocks to a Size Segment

Stocks from the parent benchmarks are categorized into one of three market-capitalization bands - large, mid, or small. For details on this process, please refer to the Morningstar Broad Style Indexes methodology.

Appendix 6: Determining Value and Size Tilts

Weights of each constituent in a given index are tilted toward small-/micro-cap and value, a part of the market that has historically outperformed the total U.S. market over long periods of time. The weight adjustment factors are determined as follows:

Let:

W_{AB}= the market weight of style index AB as a fraction of the parent index, A = L, M, or S; B = V., C, or G. By definition:

$$\sum_{A\in\{L,M,S,\}}\sum_{B\in\{V,C,G\}} W_{AB} = 1$$

For A = L, M, and S, is defined:

$$W_A = \sum_{B\in\{V,C,G\}} W_{AB}$$

Similarly, for B = V, C, and G, is defined:

$$W_B = \sum_{A\in\{L,M,S\}} W_{AB}$$

We also divide the market into asymmetric quadrants as follows:

$$W_I = W_{LC} + W_{LG} + W_{MC} + W_{MG}$$

$$W_{\mathrm{II}} = W_{LV} + W_{MV}$$

$$W_{\mathrm{III}} = W_{SV}$$

$$W_{\mathrm{IV}} = W_{SC} + W_{SG}$$

A parallel notation is used for the portfolio by replacing uppercase W with lowercase w. For example, W_{MC} is the allocation to the Mid-Cap Core Index, W_M is the mid-cap allocation, and W_I is the allocation to quadrant I.

The value tilt is defined as a number between 0 and 1 that represents how much the portfolio is tilted toward value. The formula for the value tilt is:

$$\varphi_X = W_V - \frac{W_V}{W_G} W_G$$

Similarly, we define the size tilt as a number between 0 and 1 that represents how much the portfolio is tilted toward small-cap. The formula for the size tilt is:

$$\varphi_Y = W_S - \frac{W_S}{W_L} W_L$$

Problem and Solution

Value and size tilt targets are denoted as θX and θY, respectively. To reach these targets, weight is allocated across the quadrants. It is assumed that within each quadrant, relative market weighting is maintained. Therefore:

$$W_{LV} = \frac{W_{LV}}{W_{\mathrm{II}}} W_{\mathrm{II}}$$

$$W_{LC} = \frac{W_{LC}}{W_I} W_I$$

$$W_{LG} = \frac{W_{LG}}{W_I} W_I$$

$$W_{MV} = \frac{W_{MV}}{W_{II}} W_{II}$$

$$W_{MC} = \frac{W_{MC}}{W_I} W_I$$

$$W_{MG} = \frac{W_{MG}}{W_I} W_I$$

$$W_{SV} = W_{III}$$

$$W_{SC} = \frac{W_{SC}}{W_{IV}} W_{IV}$$

$$W_{SG} = \frac{W_{SG}}{W_{IV}} W_{IV}$$

Hence, we need to determine four values; namely, w_{I}, w_{II}, w_{III}, and w_{IV}. We have three conditions to impose:

- The quadrant weights must sum to one:

$$\sum_{Q_e(\mathrm{I,II,III,}IV)} W_Q = 1$$

- The value tilt target must be met: $\varphi_X = \theta_X$
- The size tilt target must be met: $\varphi_Y = \theta_Y$

Because the three conditions are linear, three of the four quadrant weights can be expressed as a linear function of the remaining one. Express W_{II} and W_{IV} as functions of W_{III} as follows:

$$W_{\mathrm{II}} = \alpha_{\mathrm{II}} + \beta_{\mathrm{II}} W_{\mathrm{III}}$$

$$W_{IV} = \alpha_{IV} + \beta_{IV} W_{III}$$

Whereα_{II},β_{II},α_{IV}, and β_{IV} are coefficients to be determined.

Since the quadrant weights must sum to 1:

$$W_{\mathrm{I}} = 1 - W_{\mathrm{II}} - W_{\mathrm{III}} - W_{\mathrm{IV}}$$

Thus, we can write:

$$W_{\mathrm{I}} = \alpha_{\mathrm{I}} + \beta_{\mathrm{I}} W_{\mathrm{III}}$$

Where:

$$\alpha_{\mathrm{I}} = 1 - \alpha_{\mathrm{II}} - \alpha_{\mathrm{IV}}$$
$$\beta_{\mathrm{I}} = -(\beta_{\mathrm{II}} + 1 + \beta_{\mathrm{IV}})$$

For completeness, is defined:

α_{III} **=0**
β_{III}**= 1**

From conditions (1), (2), and (3) the following pair of linear equations is derived in W_{II} and W_{IV}

$$a_{11} W_{\mathrm{II}} + a_{12} W_{\mathrm{IV}} = \theta_Y + \frac{W_S}{W_L}\frac{W_{LC} + W_{LG}}{W_{\mathrm{I}}} - \left(1 + \frac{W_S}{W_L}\frac{W_{LC} + W_{LG}}{W_{\mathrm{I}}}\right) W_{\mathrm{III}}$$

$$a_{21} W_{\mathrm{II}} + a_{22} W_{\mathrm{IV}} = \theta_X + \frac{W_V}{W_G}\frac{W_{MG} + W_{LG}}{W_{\mathrm{I}}} - \left(1 + \frac{W_V}{W_G}\frac{W_{MG} + W_{LG}}{W_{\mathrm{I}}}\right) W_{\mathrm{III}}$$

Where:

$$a_{11} = \frac{W_S}{W_L}\left(\frac{W_{LC} + W_{LG}}{W_I} - \frac{W_{LV}}{W_{II}}\right)$$

$$a_{12} = \frac{W_S}{W_L}\frac{W_{LC} + W_{LG}}{W_{\mathrm{I}}} + 1$$

$$a_{21} = \frac{W_V}{W_G}\frac{W_{MG} + W_{LG}}{W_{\mathrm{I}}} + 1$$

$$a_{22} = \frac{W_V}{W_G}\left(\frac{W_{MG} + W_{LG}}{W_{\mathrm{I}}} - \frac{W_{SG}}{W_{\mathrm{IV}}}\right)$$

The solution to this pair of equations is:

$$W_{\mathrm{II}} = A_{11}\left(\theta_Y + \frac{W_S}{W_L}\frac{W_{LC}+W_{LG}}{W_{\mathrm{I}}}\right) + A_{12}\left(\theta_X + \frac{W_V}{W_G}\frac{W_{MG}+W_{LG}}{W_I}\right) - \left[A_{11}\left(1 + \frac{W_S}{W_L}\frac{W_{LC}+W_{LG}}{W_I}\right) + A_{12}\left(1 + \frac{W_V}{W_G}\frac{W_{MG}+W_{LG}}{W_I}\right)\right]W_{\mathrm{III}}$$

$$W_{IV} = A_{21}\left(\theta_Y + \frac{W_S}{W_L}\frac{W_{LC}+W_{LG}}{W_I}\right) + A_{22}\left(\theta_X + \frac{W_V}{W_G}\frac{W_{MG}+W_{LG}}{W_I}\right) - \left[A_{21}\left(1 + \frac{W_S}{W_L}\frac{W_{LC}+W_{LG}}{W_I}\right) + A_{22}\left(1 + \frac{W_V}{W_G}\frac{W_{MG}+W_{LG}}{W_I}\right)\right]W_{III}$$

Where:

$$A_{11} = \frac{a_{22}}{a_{11}a_{22} - a_{21}a_{22}}$$

$$A_{12} = \frac{-a_{12}}{a_{11}a_{22} - a_{21}a_{22}}$$

$$A_{21} = \frac{-a_{21}}{a_{11}a_{22} - a_{21}a_{22}}$$

$$A_{22} = \frac{a_{11}}{a_{11}a_{22} - a_{21}a_{22}}$$

Hence, it follows that:

$$\alpha_{\mathrm{II}} = A_{11}\left(\theta_Y + \frac{W_S}{W_L}\frac{W_{LC}+W_{LG}}{W_I}\right) + A_{12}\left(\theta_X + \frac{W_V}{W_G}\frac{W_{MG}+W_{LG}}{W_I}\right)$$

$$\beta_{II} = -\left[A_{11}\left(1 + \frac{W_S}{W_L}\frac{W_{LC}+W_{LG}}{W_I}\right) + A_{12}\left(1 + \frac{W_V}{W_G}\frac{W_{MG}+W_{LG}}{W_I}\right)\right]$$

$$\alpha_{\mathrm{IV}} = A_{21}\left(\theta_Y + \frac{W_S}{W_L}\frac{W_{LC}+W_{LG}}{W_I}\right) + A_{22}\left(\theta_X + \frac{W_V}{W_G}\frac{W_{MG}+W_{LG}}{W_I}\right)$$

$$\beta_{IV} = -\left[A_{21}\left(1 + \frac{W_S}{W_L}\frac{W_{LC}+W_{LG}}{W_I}\right) + A_{22}\left(1 + \frac{W_V}{W_G}\frac{W_{MG}+W_{LG}}{W_I}\right)\right]$$

We have now reduced the problem of selecting a tilted portfolio to the choice of a single variable: namely, w_{III}. However, the choice of w_{III} is limited by the constraint that all of the quadrant weights be between 0 and 1. Since we now can express each quadrant weight as a linear function of w_{III}, we can find the lower and upper limits on w_{III} as follows:

For each quadrant Q = I, II, III, IV, calculate:

$$L_Q = \min\left(\frac{-\alpha_Q}{\beta_Q}, \frac{1-\alpha_Q}{\beta_Q}\right)$$

$$H_Q = \max\left(\frac{-\alpha_Q}{\beta_Q}, \frac{1-\alpha_Q}{\beta_Q}\right)$$

Then calculate:

$$W_{\text{III}}^{min} = \underset{Q\epsilon\{\text{I,II,III,IV}\}}{max} L_Q$$

$$W_{III}^{max} = \underset{Q\epsilon\{I,II,III,IV\}}{min} H_Q$$

The first candidate for W_{III} is the one that minimizes the Euclidean distance between the investor's quadrant allocations to the market quadrant allocations. The problem is:

$$\min_{W_{\text{III}}} \sum_{Q\epsilon\{I,II,III,IV\}} \left(\alpha_Q + \beta_Q w_{III} - W_Q\right)^2$$

The solution to this problem is:

$$\widehat{w}_{\text{III}} = \frac{\sum_{Q\epsilon\{I,II,III,IV\}} (W_Q - \alpha_Q)\beta_Q}{\sum_{Q\epsilon\{I,II,III,IV\}} (\beta_Q)^2}$$

If $w_{\text{III}}^{min} \leq \widehat{w}_{III} \leq w_{\text{III}}^{max}$, the problem is solved. Otherwise, there are two remaining candidates; namely w_{III}^{min} and w_{III}^{max}. Each candidate is evaluated by the Euclidean distance between the resulting portfolio and to the market-weighted portfolio of the nonzero quadrants of the candidate solution.

Value and size tilt targets are denoted as θX and θY, respectively.

To determine the size and value target tilt factors (θX and θY) for the Morningstar Developed ex-US Factor Tilt Index, the three-factor Fama French (FF) model was considered. The three factors are: excess return on the developed market portfolio; SMB, which is the difference between the returns of a small-cap developed-market portfolio and the large-cap developed-market portfolio; and HML, which is the difference in returns between a high book/market and low book/market portfolio.

Through this statistical context, the linear regression results of monthly returns for 25 distinct developed market portfolios were considered. To construct the 25 developed portfolios, first 25 developed ex-US portfolios were constructed by incrementing the size and value tilt factors by 0.1. Recall that a size and value tilt of 0 results in no tilt—that is, a float market-cap-weighted portfolio. Next, the 25 developed ex-U.S. portfolios were combined with the Morningstar US Market Factor Tilt Index assuming a 60% allocation to U.S. and 40% allocation to developed ex-U.S. markets, rebalanced quarterly.

A size tilt factor of 0.20 and value tilt factor of 0.1 results in FF regression coefficients (the betas) over the 11-plus year history of **SMB 0.14 and HML of 0.21**. These coefficients were selected as the optimal strategy for this portfolio tilted toward small and value. At each reconstitution, the Morningstar Index Committee will review the long-term explanation of portfolio exposures within the context of the FF regression to ensure the tilt factors continue to be appropriate.

For the US Market Factor Tilt index, an equivalent process is undertaken. At each reconstitution, we select from the 25 candidate portfolios the one that has beta exposures closest to the target of **SMB=0.14 and HML=0.16.** These coefficients are selected as the optimal strategy for a U.S. market portfolio tilted toward small and value.

Appendix 7: Individual Indexes

Index Name	Inception Date	Performance Start Datee
Morningstar US Market Factor Tilt Index	11-Sept-14	97-Jun-30
Morningstar Developed Markets ex-US Factor Tilt Index	12-Sept-12	01-Dec-21
Morningstar Emerging Markets Factor Tilt Index	12-Sept-12	01-Dec-21

About Morningstar Indexes

Morningstar Indexes was built to keep up with the evolving needs of investors—and to be a leading-edge advocate for them. Our rich heritage as a transparent, investor-focused leader in data and research uniquely equips us to support individuals, institutions, wealth managers, and advisors in navigating investment opportunities across major asset classes, styles, and strategies. From traditional benchmarks and unique IP-driven indexes to index design, calculation, and distribution services, our solutions span an investment landscape as diverse as investors themselves.

Morningstar Index Methodology Committee

The Morningstar Index Methodology Committee oversees all new index development, index methodology changes, and cessation of indexes for any indexes where Morningstar owns the intellectual property. This committee is also charged with ensuring that indexes align with Morningstar Research principles and values. The group comprises members of the index team with index research, product development, product management, client service, index implementation, and operation expertise who provide the first layer of governance over index design and methodology.

Morningstar Indexes Operations Committee

The Morningstar Index Operations Committee governs the processes, systems, and exception handling of the day-to-day management of all live indexes, including index rebalancing and reconstitution, restatements, market classification, and contingency management. The committee oversees the annual review of index methodology, as required by the European Benchmarks Regulation ("BMR"), ensuring that methodologies remain fit for purpose and continue to achieve their stated investment objectives. The group comprises members of the index team with data, operations, corporate actions, product development, index launch, client service, and index management experience who provide the first layer of governance over index operations.

Morningstar Index Oversight Committee

The Morningstar Index Oversight Committee is responsible for the index oversight function as per the requirements of the European Benchmarks Regulation ("BMR"), providing independent oversight of all aspects of the governance of benchmark administration as required by the BMR. Its remit extends to all calculation and administration-related business activities of Morningstar Indexes, including administration of Morningstar-owned benchmarks as well as client-owned benchmarks and index calculation. The oversight function is part of the organizational structure of Morningstar but is separate and independent from the index business, index management, and the other index committees.

www.indexes.morningstar.com

Contact Us

indexes@morningstar.com