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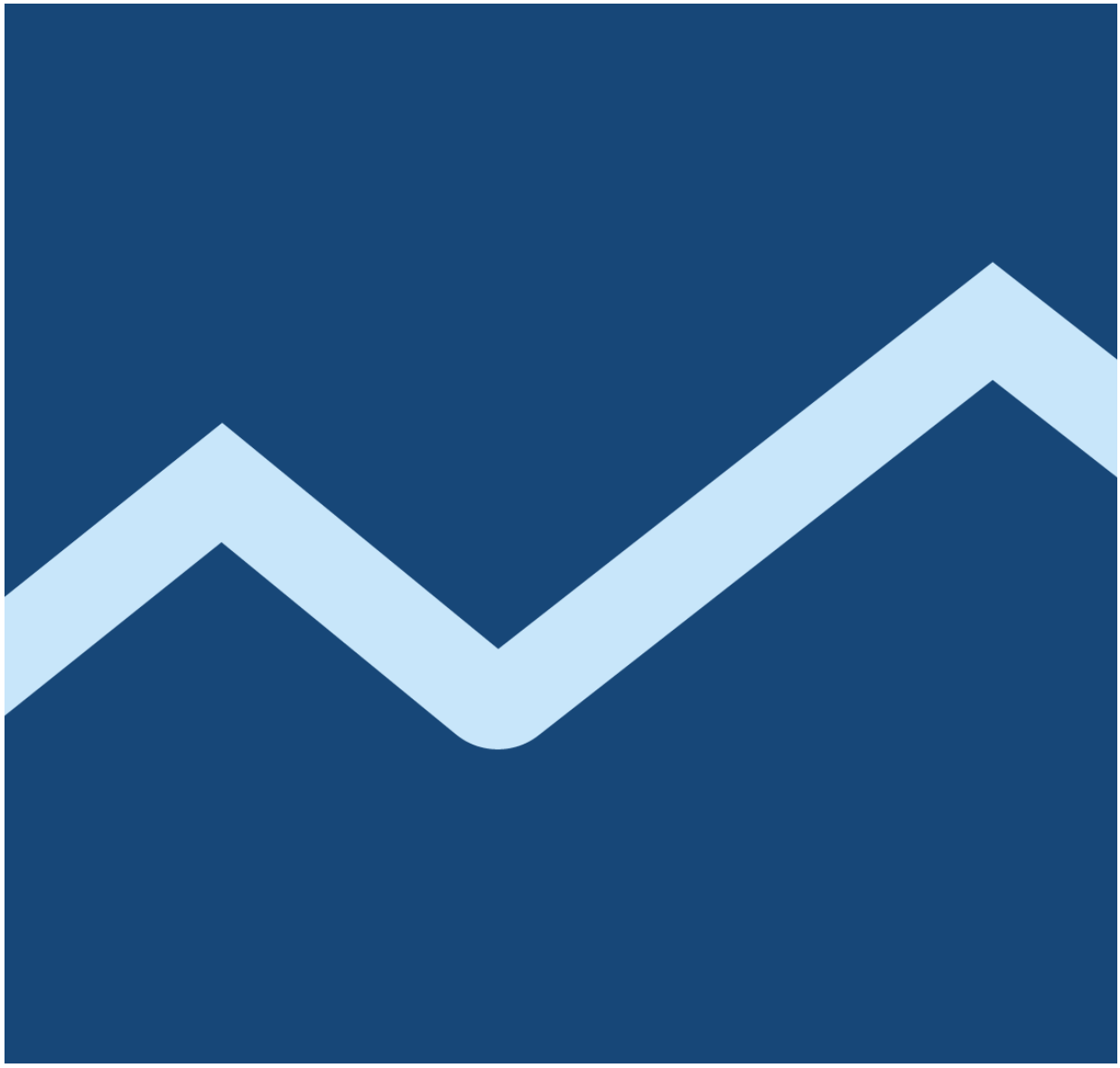
STOXX

iSTOXX® L&G Indices Methodology Guide

STOXX.com



ISS STOXX

Part of DEUTSCHE BÖRSE GROUP

CONTENTS

1. INTRODUCTION TO THE STOXX INDEX GUIDES

The STOXX index guides are separated into the following sub-sets:

- The **STOXX Calculation guide** provides a general overview of the calculation of the STOXX equity indices, the dissemination, the index formulas and adjustments due to corporate actions
- The **STOXX Index Methodology guide** contains the equity index specific rules regarding the construction and derivation of the portfolio based indices, the individual component selection process and weighting schemes
- The **STOXX World Equity Index Methodology guide** contains the index specific rules regarding the construction and derivation of the STOXX World portfolio based indices, the individual component selection process and weighting schemes
- The **STOXX Strategy Index guide** contains the formulas and description of all strategy indices
- The **STOXX DVP Calculation guide** describes the dividend points products
- The **STOXX Distribution Points Calculation guide** describes the distribution points products
- The **iSTOXX Fund Indices Methodology guide** contains the index specific rules regarding the construction and derivation of the iSTOXX Fund indices, the individual component selection process and weighting schemes
- The **iSTOXX Strategy Indices Methodology guide** contains the index specific rules regarding the construction and derivation of the iSTOXX Strategy indices, the individual component selection process and weighting schemes
- The **iSTOXX Decrement Indices Methodology guide** contains the index specific rules regarding the construction and derivation of the iSTOXX Decrement indices, the individual component selection process and weighting schemes
- The **iSTOXX Equity Indices Methodology guide** contains the index specific rules regarding the construction and derivation of the iSTOXX Equity indices, the individual component selection process and weighting schemes
- The **STOXX Reference Rates guide** contains the rules and methodologies of the reference rate indices
- The **STOXX Reference Calculations guide** provides a detailed view of definitions and formulas of the calculations as utilized in the reports, factsheets, indices and presentations produced by STOXX
- The **STOXX Currency Rates Indices Methodology guide** contains the index specific rules regarding the construction and calculation of the derivation of the STOXX FX Rolling Spot Mid Rate and STOXX FX Rolling Spot Tomorrow Next Open Rate indices
- The **Guide to Industry Classifications Used By STOXX** contains general information pertaining to industry classifications used in STOXX indices, together with any references and links to third-parties that create the data.
- The **STOXX Eligible Market Segments guide** contains the list of stock exchanges and market segments.
- The **STOXX Digital Asset Methodology guide** contains the index specific rules regarding the construction and calculation of the STOXX Digital Asset Indices.

All rule books are available for download on http://www.stoxx.com/indices/rulebooks.html

2. CHANGES TO THE GUIDE BOOK

2.1. HISTORY OF CHANGES TO THE ISTOXX L&G INDICES METHODOLOGY GUIDE

- November 2024: Addition of iSTOXX L&G Developed World Single-Factor Indices along with the addition of iSTOXX L&G Single Factor Indices, iSTOXX L&G Multi-Factor Indices and iSTOXX L&G Multi -Factor ESG Indices from iSTOXX Methodology Guide
- November 2024(2): Addition of iSTOXX L&G Diversified Multi-Factor ESG Indices
- December 2024: Addition of iSTOXX L&G Diversified Multi-Factor ESG Monthly Hedged Indices
- April 2025: Removed reference of iSTOXX ESG Methodology guide
- August 2025: Clarification in the section 'Overview' of iSTOXX L&G Diversified Multi-Factor ESG indices
- February 2026: Addition of iSTOXX L&G Global Multi-Factor ESG Monthly Hedged, iSTOXX L&G Global Multi-Factor ESG Monthly Hedged 12UK and iSTOXX L&G Global Multi-Factor ESG 12UK Index
- March 2026: Update in the section of 'Introduction to the STOXX Index Guides' and renaming of STOXX World Indices

3. GENERAL PRINCIPLES

3.1. INDEX RATIONALE

STOXX defines the index rationale as the basis for applying a certain methodology in order to achieve the index objective. STOXX performs intensive research and may conduct conversations with market participants and third parties for this purpose. STOXX discloses the index objective in every case.

3.2. METHODOLOGY REVIEW POLICIES

STOXX constantly monitors the execution of the index calculation rules in order to ensure the validity of the index methodology. STOXX also conducts general methodology reviews in a periodic and ad-hoc basis, to reflect economic and political changes and developments in the investment industry. As result of these activities, STOXX introduces changes to the methodology books. Material changes are notified to subscribers and the media through the usual communication channels. Clarifications of the methodology are updated in the rulebook. All changes are tracked in the section 2 CHANGES TO THE GUIDE BOOK
HISTORY OF CHANGES TO THE iSTOXX L&G .

3.3. INDEX TERMINATION POLICY

For the termination of an index or index family for which outstanding products are present in the market to the knowledge of STOXX, a market consultation with the involved clients will be initiated by STOXX to take into account their views and concerns related to the termination or transition. A consultation period will be opened. Its duration depends on the specific issue. After the consultation period and in case of further action needed, a notification will be issued and the process defined above will be followed. In the case of a transition, STOXX will launch the alternative index and will notify of its character as a suitable replacement for an existing index whose calculation should be discontinued in the future. This notification advices clients on the alternative recommended by STOXX as replacement. The timeframe in which both indices will be calculated in parallel will be disclosed in the notification's text and will be no shorter than three months.

For the termination of an index or index family for which, to the knowledge of STOXX, no listed financial products are issued in the market, a press release notification or e-mail notification to subscribers will be communicated at least three months before coming into force. Clients or third parties with interest in the index or index family are urged to communicate as soon as possible their concerns to STOXX. Based on the feedback collected, STOXX may alter the index termination decision. For the termination of an index without financial product issued on there will be no market consultation. Changes to the original notification will be communicated in the same manner.

3. GENERAL PRINCIPLES

3.4. REPLACEMENT FOR INDICES WITH FIXED NUMBER OF CONSTITUENTS

When referred to this section the below applies only during review implementation month:

During review implementation month, the published review report in combination with the selection list will be used to select a replacement. With the public announcement of the review report in the review implementation month, the highest ranked non-component from the selection list, which is not announced an addition to the affected index from the review report at the review effective date, will replace the deleted stock ("next viable replacement").
For certain replacements occurring during review month and before the rebalancing date:

- If a deleted stock was scheduled for a deletion in an (size) index at the review effective date to a lower size index or entirely, the afore-mentioned process of adding the next viable replacement applies. However, to balance the number of additions and deletions at the review effective date, the lowest ranked index component on the selection list, within the same (size) index and which was not announced a deletion from the review report, will be deleted at the review effective date.

- If a deleted stock was scheduled for an addition in an (size) index at the review effective date, the afore-mentioned process of adding the next viable replacement applies. However, to balance the number of additions and deletions at the review effective date, the highest ranked index component on the selection list, within the same (size) index and which was not announced an addition from the review report, will replace the deleted addition at the review effective date.

4. iSTOXX L&G SINGLE FACTOR INDICES

4.1. iSTOXX L&G SINGLE FACTOR INDICES

4.1.1. OVERVIEW

The iSTOXX L&G Single-Factor indices are designed to provide exposure to Value, Momentum, Low Volatility and Quality risk-premia factors, where style factor scores are provided by Legal and General Investment Management (LGIM). The indices track the STOXX World Universal regional indices, while ensuring tradability, diversification, and liquidity. A Global index is constructed by aggregating the six regional indices using the regional weights of STOXX World AC Universal Index as shown in the table below:

Region/Index	Value	Quality	Low Volatility	Momentum
North America	x	x	x	x
Europe ex UK	x	x	x	x
UK	x	x	x	x
Asia Pacific ex Japan	x	x	x	x
Japan	x	x	x	x
Emerging Markets	x	x	x	x
Global-region neutral[1]	x	x	x	x

Universe: STOXX World Universal regional indices:

- North America
- Developed Europe ex United Kingdom
- Japan
- United Kingdom
- Developed Asia Pacific ex Japan
- Emerging Markets

Weighting scheme: The The indices are weighted according to a two-step approach using tilt and optimization.

Base values and dates: 100 on March 18th, 2002

Index types and currencies: Price, net, and gross return in EUR, GBP, and USD.

For a complete list please consult the data vendor code sheet on the website[2]. Customized solutions can be provided upon request.

Dissemination calendar: STOXX Global calendar

[1] The global region neutral version is constructed by using the weights of the regional sleeves in the STOXX World AC Universal benchmark.

[2] www.stoxx.com/documents/stoxxnet/Documents/Resources/Data_Vendor_Codes/vendor_codes_sheet.csv

4. iSTOXX L&G SINGLE FACTOR INDICES

4.1.2. INDEX REVIEW

Constituent Selection: The portfolio construction is performed using LGIM's Value, Momentum, Low Volatility, and Quality factor scores and Axioma's portfolio optimization software and risk models.

Axioma Risk Model: The following Axioma Medium-Horizon Fundamental Factor Risk Models are used by region:

Region	Risk Model	Numeraire
North America	NA4-MH	USD
Europe ex UK	EU4-MH	EUR
UK	EU4-MH	GBP
Asia Pacific ex Japan	APxJP4-MH	USD
Japan	JP4-MH	JPY
Emerging Markets	EM4-MH	USD

If the regional model is not available on a rebalance date due to a public holiday, then the risk model from the last business day is used in its place.

Factor Scores: The LGIM factor scores are constructed from a combination of regional and sector z-scores and have a domain between -3 and 3.

A **Factor Tilt portfolio** for Value, Momentum, Low Volatility, and Quality factors is first calculated by tilting the Free Float Market Capitalization of each security as:

$$\overline{w}_i = w_{b,i} * (1 + \frac{1}{3}\text{Factor Score}_i)^k$$

where:

- $\overline{w_i}$ is the weight of security i in the Factor Tilt Portfolio
- $w_{b,i}$ is the weight of security i in the Parent Index
- Factor Score_i is the L&G Style Factor z-score
- k is the tilt strength.

The tilt strength k starts at 2 and is incremented by one until the Active Share of the Factor Tilt portfolio vs the parent index is equal to, or higher than, 40%.

An optimized factor portfolio for Value, Momentum, Low Volatility, and Quality is then constructed by minimizing the following objective function:

$$\sum_i |w_i - \overline{w_i}| + 0.1 \sqrt{\sum_i (w_i - \overline{w_i})^2}$$

where w_i and $\overline{w_i}$ are the optimized and factor tilt portfolio weights for the ith asset. The first term minimizes the active share of the optimized portfolio to the factor tilt portfolio. The 2nd term minimizes the sum of squares distance of optimized portfolio to the factor tilt portfolio – it regularizes the objective function and ensures that the portfolio model has a unique solution.

4. iSTOXX L&G SINGLE FACTOR INDICES

The portfolio model also includes the following constraints to ensure diversification and control for unintended systematic exposures and tradability.

Do Not Hold (Exclusions)	Bottom 5% market cap with lowest factor exposure
Min Industry Exposure	50% of Parent Index
Active Industry Bounds	+/-5% ICB Industries (Level 1)
Active Country Bounds	+/- 5% (STOXX Country)
Active Untargeted Style Exposures	+/- 0.25 std except targeted style factors
Liquidity	Percentile Days to Trade
Turnover	30% Annual one-way
Max Ex-ante Tracking Error	3.5%
Max Asset Weight	20x Parent Index Weight
Active Asset Weight Bounds	+/- 3%
Max Total Weight of Top 10 Holdings	1.5 x Total Weight of Parent Index Top 10 Holdings
UCITS	4.5%/8%/35%
Limit Transaction Cost	Annualized TC should be below LGIM's regional bound
Max Active Share to Parent Index	40%
Max Active Share to Factor Tilt Portfolio	15%

A brief description of the portfolio constraints is given below:

Exclusions: Do not hold the bottom 5% of stocks by market capitalization with the lowest targeted style factor exposure.

Minimum Industry Exposure: The percentage exposure to each ICB Industry must be at least half of the Parent Index.

Active Industry Weights: The percentage exposure to each ICB Industry must be within +/- 5% of the Parent Index.

Active Country Weights: The percentage exposure to each country must be within +/- 5% of the Parent Index value. Each company's country assignment is based on the STOXX Country classification.

Active Untargeted Style Exposures: The exposure to each of the untargeted LGIM factors as well as the Axioma Risk Model style factors must be within 0.25 standard deviations of the Parent Index's factor exposures.

Limit turnover: The Index has an annual one-way turnover limit of 30%.

4. iSTOXX L&G SINGLE FACTOR INDICES

Active Risk: The active risk of the index relative to the Parent Index is constrained to a maximum of 3.5%.

Maximum Asset Weight: Restricted to 20 times its weight in the Parent Index.

Asset Holding Limits: The maximum weight of each asset in the index is +/- 3% of its weight in the Parent Index.

Maximum Total Weight of Top 10 Holdings: The maximum total weight of the top 10 holdings is limited to 1.5 times the total weight of the top 10 holdings in the Parent Index.

UCITS bounds: The maximum weight of each issuer in the index is 8%. The sum of the weights of those issuers above 4.5% cannot exceed 35%. By applying tighter constraints (4.5% / 8% / 35%) than the standard UCITs bounds (5% / 10% / 40%), we reduce the likelihood of breaching UCITs thresholds, and reduce the gravity of the breaches if they occur.

Limit Transaction Costs: Total TC across four rebalances in a year cannot exceed the annual regional limits given in the table below. Stock level transaction cost data is based on stock's region assignment and is provided by LGIM.

Maximum Active Share to Parent Index: The maximum Active Share of the index is 40% with regards to the Parent Index.

Maximum Active Share to Factor Tilt Portfolio: The maximum Active Share of the index is 15% with regards to the Factor Tilt Portfolio.

Percentile days to trade/liquidity constraint: The maximum weight of each component in the Index is limited to twenty times its 60-day median daily trading volume multiplied by the ratio of benchmark weight and 60-day median daily trading volume of the representative stock p. The representative asset is the 10th percentile of all constituents in the Parent Index when sorted by the ratio of 60-day median trading volume divided by the Parent Index weight.

$$w_k \leq S\, V_k\, \frac{b_p}{V_p}$$

where:

- w_k is the weight of the kth asset in the portfolio
- p = the asset with the 10-th percentile of $\frac{V_k}{b_k}$
- b_k= the weight of the kth asset in the benchmark
- V_k= the daily trading volume for the kth asset
- S = 20 (Strength)

Infeasibility Handling: If a solution that satisfies the above constraints cannot be found, the following constraints are relaxed using Axioma's proprietary constraint hierarchy procedure.

1. Maximum Turnover, Percentile days to trade, and Limit Transaction Costs in Level 1, and
2. Active Share to Factor tilt portfolio and Active Asset Weight in Level 2.

4. iSTOXX L&G SINGLE FACTOR INDICES

Constraints in Level 1 have precedence over the constraints in Level 2 in the amount that they are relaxed (softened).

The constraint hierarchy is set up so that the optimization can find a relaxed solution if necessary. If the optimization is still unable to find a solution after this additional stage of constraint relaxation, the rebalance for the quarter will not take place.

Review frequency: The reviews are conducted on a quarterly basis in April, July, October, and January. The implementation is conducted after the close of third Friday in the review months and effective the next trading day. The weighting factors are calculated based on closing prices from the Wednesday before the second Friday of the review month. Weighting factor = (stock's target weight × 1.000.000.000 / closing price of the stock in EUR) rounded to the nearest integer. Only stocks leaving the STOXX World AC Universal All Cap index in the March, June, September, and December reviews will leave the optimized indexes. Stocks leaving the parent index but not the STOXX World AC Universal All Cap index in the March, June, September, and December reviews will remain in the optimized single-factor indexes.

4.1.3. ONGOING MAINTENANCE

Replacements: Deleted companies are not replaced.

Fast exit: Applicable

Fast entry: Not applicable.

Spin-offs: Spin-off stocks are not added permanently.

Corporate Actions: All components are maintained for corporate actions as outlined in the STOXX calculation guide available on stoxx.com.

Regions: The regions considered, and their construction is detailed below:

Regional Basket	STOXX Regional/Country Index	Axioma Risk Model
North America	STOXX North America Universal - SWNAGV	NA4-MH
Europe ex United Kingdom	STOXX Developed Europe ex UK Universal - SWDEGGV	EU4-MH
United Kingdom	STOXX UK Universal - SWUKGV	EU4-MH
DM APAC ex Japan	STOXX-Developed-Asia-Pacific-ex-Japan Universal - SWDXGV	APxJP4-MH
Japan	STOXX Japan Universal - SWJPGV	JP4-MH

4. iSTOXX L&G SINGLE FACTOR INDICES

4.2. iSTOXX L&G MULTIFACTOR INDICES

4.2.1. OVERVIEW

The iSTOXX L&G Multifactor index is designed to provide exposure to regional Value, Momentum, Low Volatility and Quality risk-premia factors, where style factor scores are provided by Legal and General Investment Management (LGIM). The indices track the STOXX World Universal regional indices, while ensuring tradability, diversification, and liquidity. A Global index is constructed by aggregating the six regional indices using the regional weights of STOXX World AC Universal Index as described in the table below.

Region/Index	Multifactor
North America	x
Europe ex UK	x
UK	x
Asia Pacific ex Japan	x
Japan	x
Emerging Markets	x
Global-region neutral[3]	x

Universe: STOXX World Universal regional indices:

- North America
- Developed Europe ex United Kingdom
- Japan
- United Kingdom
- Developed Asia Pacific ex Japan
- Emerging Markets

Weighting scheme: The indices are weighted using an optimization model.

Base values and dates: 100 on March 18th, 2002

Index types and currencies: Price, net, and gross return in EUR, GBP, and USD.

For a complete list please consult the data vendor code sheet on the website[4]. Customized solutions can be provided upon request.

Dissemination calendar: STOXX Global calendar

[3] The global region neutral version is constructed by using the weights of the regional sleeves in the STOXX World AC Universal benchmark

[4] www.stoxx.com/documents/stoxxnet/Documents/Resources/Data_Vendor_Codes/vendor_codes_sheet.csv

4. iSTOXX L&G SINGLE FACTOR INDICES

4.2.2. INDEX REVIEW

Constituent Selection: The portfolio construction is performed using LGIM's Value, Momentum, Low Volatility, and Quality factor scores and Axioma's portfolio optimization software and risk models.

Axioma Risk Model: The following Axioma Medium-Horizon Fundamental Factor Risk Models are used by region:

Region	Risk Model	Numeraire
North America	NA4-MH	USD
Europe ex UK	EU4-MH	EUR
UK	EU4-MH	GBP
Asia Pacific ex Japan	APxJP4-MH	USD
Japan	JP4-MH	JPY
Emerging Markets	EM4-MH	USD

If the regional model is not available on a rebalance date due to a public holiday, then the risk model from the last business day is used in its place.

Factor Scores: The LGIM factor scores are constructed from a combination of regional and sector z-scores and have a domain between -3 and 3.

A **Factor Tilt portfolio** for Value, Momentum, Low Volatility, and Quality is first calculated by tilting the Free Float Market Capitalization of each security as:

$$\overline{w_i} = w_{b,i} * (1 + \frac{1}{3}\text{Factor Score}_i)^k$$

where:

- $\overline{w_i}$ is the weight of security i in the Factor Tilt Portfolio
- $w_{b,i}$ is the weight of security i in the Parent Index
- Factor Score is the L&G Style Factor z-score for the ith factor
- k is the tilt strength

The tilt strength k starts at 2 and is incremented by one until the Active Share of the Factor Tilt Portfolio vs the parent index is equal to, or higher than, 40%.

Second, the Multifactor tilt portfolio is constructed with the same approach, using the Multifactor score, which is derived as a weighted average of the Value, Momentum, Low Volatility, and Quality factor scores, where the weight of each factor score is the scaled inverse ex-ante TE of its tilt portfolio from the parent index, based on the formula below:

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$$\Theta_i = \left(\frac{\frac{1}{\sigma_i}}{\sum_j \frac{1}{\sigma_j}} \right), i = 1, \dots, 4,$$

where $\sigma_i = \sqrt{(\overline{w} - b)\text{^T } Q(\overline{w} - b)}$ is the ex-ante TE of the ith factor tilt portfolio from the parent index where w and b denote the portfolio and benchmark weights, respectively and Q is the covariance matrix associated with the regional Axioma risk model.

The Multifactor score is calculated as

$$\text{Multifactor score} = \sum_i \Theta_i * \text{Factor score for the ith factor},$$

where Θ_i is the weight applied to the ith factor score in each region.

The Multifactor tilt portfolio $\overline{w}$ is then constructed using the Factor tilt algorithm on the Multifactor score.

Third, the Multifactor optimized factor portfolio is constructed by minimizing the following objective function:

$$\sum_i |w_i - \overline{w_i}| + 0.1 \sqrt{\sum_i (w_i - \overline{w_i})^2}$$

where w_i and $\overline{w_i}$ are the optimized and Multifactor tilt portfolio weights for the ith asset. The first term minimizes the active share of the optimized portfolio to the Multifactor tilt portfolio. The 2nd term minimizes the sum of squares distance of optimized portfolio to the Multifactor tilt portfolio – it regularizes the objective function and ensures that the portfolio model has a unique solution.

Third, the Multifactor optimized portfolio is constructed by minimizing the active share to the Multifactor tilt portfolio.

The portfolio model also includes the following constraints to ensure diversification and control for unintended systematic exposures and tradability.

Do Not Hold (Exclusions)	Bottom 5% market cap with lowest factor exposure
Min Industry Exposure	50% of Parent Index
Active Industry Bounds	+/-5% ICB Industries (Level 1)
Active Country Bounds	+/- 5% (STOXX Country)
Active Untargeted Style Exposures	+/- 0.25 std except targeted style factors
Liquidity	Percentile Days to Trade
Turnover	30% Annual one-way
Ex-ante Tracking Error	3.5%
Max Asset Weight	20x Parent Index Weight

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Active Asset Weight Bounds	+/- 3%
Max Total Weight of Top 10 Holdings	1.5 x Total Weight of Parent Index Top 10 Holdings
UCITS	4.5%/8%/35%
Limit Transaction Cost	Annualized TC should be below LGIM's regional bound
Max Active Share to Parent Index	40%
Max Active Share to Factor Tilt Portfolio	15%
Equal Factor Active Risk contribution	-

A brief description of the portfolio constraints is given below:

Exclusions: Do not hold the bottom 5% of stocks by market capitalization with the lowest targeted style factor exposure.

Minimum Industry Exposure: The percentage exposure to each ICB Industry must be at least half of the Parent Index.

Active Industry Weights: The percentage exposure to each ICB Industry must be within +/- 5% of the Parent Index.

Active Country Weights: The percentage exposure to each country must be within +/- 5% of the Parent Index value. Each company's country assignment is based on the STOXX Country classification.

Active Untargeted Style Exposures: The exposure to each of the untargeted LGIM factors as well as the Axioma Risk Model style factors must be within 0.25 standard deviations of the Parent Index's factor exposures.

Limit turnover: The Index has an annual one-way turnover limit of 30%.

Active Risk: The active risk of the index relative to the Parent Index is constrained to a maximum of 3.5%.

Maximum Asset Weight: Restricted to 20 times its weight in the Parent Index.

Asset Holding Limits: The maximum weight of each asset in the index is +/- 3% of its weight in the Parent Index.

Maximum Total Weight of Top 10 Holdings: The maximum total weight of the top 10 holdings is limited to 1.5 times the total weight of the top 10 holdings in the Parent Index.

UCITS bounds: The maximum weight of each issuer in the index is 8%. The sum of the weights of those issuers above 4.5% cannot exceed 35%. By applying tighter constraints (4.5% / 8% / 35%) than the

4. iSTOXX L&G SINGLE FACTOR INDICES

standard UCITs bounds (5% / 10% / 40%), we reduce the likelihood of breaching UCITs thresholds, and reduce the gravity of the breaches if they occur.

Limit Transaction Costs: Total TC across four rebalances in a year cannot exceed the annual regional limits given in the table below. Stock level transaction cost data is based on stock's region assignment and is provided by LGIM.

Maximum Active Share to Parent Index: The maximum Active Share of the index is 40% with regards to the Parent Index.

Maximum Active Share to Factor Tilt Portfolio: The maximum Active Share of the index is 15% with regards to the Factor Tilt Portfolio.

Factor Active Risk: Each targeted style factor contributes equally to Active Risk.

Percentile days to trade/liquidity constraint: The maximum weight of each component in the Index is limited to twenty times its 60-day median daily trading volume multiplied by the ratio of benchmark weight and 60-day median daily trading volume of the representative stock p. The representative asset is the 10th percentile of all constituents in the Parent Index when sorted by the ratio of 60-day median trading volume divided by the Parent Index weight.

$$w_k \leq S\, V_k \frac{b_p}{V_p}$$

where:

- w_k is the weight of the k^{th} asset in the portfolio
- p = the asset with the 10-th percentile of $\frac{V_k}{b_k}$
- b_k= the weight of the k^{th} asset in the benchmark
- V_k= the daily trading volume for the k^{th} asset
- S = 20 (Strength).

Infeasibility Handling: If a solution that satisfies the above constraints cannot be found, the following constraints are relaxed using Axioma's proprietary constraint hierarchy procedure.

1. Maximum Turnover, Percentile days to trade, and Limit Transaction Costs in Level 1, and
2. Active Share to Factor tilt portfolio and Active Asset Weight in Level 2.

Constraints in Level 1 have precedence over the constraints in Level 2 in the amount that they are relaxed (softened).

The constraint hierarchy is set up so that the optimization can find a relaxed solution if necessary. If the optimization is still unable to find a solution after this additional stage of constraint relaxation, the rebalance for the quarter will not take place.

Review frequency: The reviews are conducted on a quarterly basis in April, July, October, and January. The implementation is conducted after the close of third Friday in the review months and effective the next trading day. The weighting factors are calculated based on closing prices from the Wednesday before the second Friday of the review month. Weighting factor = (stock's target

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weight × 1.000.000.000 / closing price of the stock in EUR) rounded to the nearest integer. Only stocks leaving the STOXX World AC Universal All Cap index in the March, June, September, and December reviews will leave the optimized indexes. Stocks leaving the parent index but not the STOXX World AC Universal All Cap index in the March, June, September, and December reviews will remain in the optimized Multifactor indexes.

4.2.3. ONGOING MAINTENANCE

Replacements: Deleted companies are not replaced.

Fast exit: Applicable

Fast entry: Not applicable.

Spin-offs: Spin-off stocks are not added permanently.

Corporate Actions: All components are maintained for corporate actions as outlined in the STOXX calculation guide available on stoxx.com.

Regions: The regions considered, and their construction is detailed below:

Regional Basket	STOXX Regional/Country Index	Axioma Risk Model
North America	STOXX North America Universal - SWNAGV	NA4-MH
Europe ex United Kingdom	STOXX Developed Europe ex UK Universal - SWDEGGV	EU4-MH
United Kingdom	STOXX UK Universal - SWUKGV	EU4-MH
DM APAC ex Japan	STOXX-Developed-Asia-Pacific-ex-Japan Universal SWDXGV	APxJP4-MH
Japan	STOXX Japan Universal - SWJPGV	JP4-MH

4. iSTOXX L&G SINGLE FACTOR INDICES

4.3. iSTOXX L&G MULTIFACTOR ESG INDICES

4.3.1. OVERVIEW

The iSTOXX L&G Multifactor ESG index is designed to provide regional exposures to Value, Momentum, Low Volatility and Quality risk-premia factors, a greater exposure to the ESG scores provided by LGIM, while achieving sustainable carbon reduction in terms of greenhouse gas emission intensities over time. The indices track the STOXX World Universal regional indices, while ensuring tradability, diversification, and liquidity. A Global index is constructed by aggregating the six regional indices using the regional weights of STOXX World AC Universal Index as described in the table below:

Region/Index	Multifactor ESG
North America	x
Europe ex UK	x
UK	x
Asia Pacific ex Japan	x
Japan	x
Emerging Markets	x
Global-region neutral[5]	x

Universe: STOXX World Universal regional indices:

- North America
- Developed Europe ex United Kingdom
- Japan
- United Kingdom
- Developed Asia Pacific ex Japan
- Emerging Markets

Weighting scheme: The indices are weighted according to an optimization model.

Base values and dates: 100 on March 18th, 2002

Index types and currencies: Price, net, and gross return in EUR, GBP, and USD.

For a complete list please consult the data vendor code sheet on the website[6]. Customized solutions can be provided upon request.

Dissemination calendar: STOXX Global calendar

Refer to the vendor code sheet on the website[6] for the similar list of indices that have been disseminated at 3PM & 12PM UK for iSTOXX L&G Global Multi-Factor ESG Index.

[5] The global region neutral version is constructed by using the weights of the regional sleeves in the STOXX World AC Universal benchmark

[6] www.stoxx.com/documents/stoxxnet/Documents/Resources/Data_Vendor_Codes/vendor_codes_sheet.csv

4. iSTOXX L&G SINGLE FACTOR INDICES

4.3.2. INDEX REVIEW

Constituent Selection: The portfolio construction is performed using LGIM's Value, Momentum, Low Volatility, and Quality factor scores and Axioma's portfolio optimization software and risk models.

Axioma Risk Model: The following Axioma Medium-Horizon Fundamental Factor Risk Models are used by region:

Region	Risk Model	Numeraire
North America	NA4-MH	USD
Europe ex UK	EU4-MH	EUR
UK	EU4-MH	GBP
Asia Pacific ex Japan	APxJP4-MH	USD
Japan	JP4-MH	JPY
Emerging Markets	EM4-MH	USD

If the regional model is not available on a rebalance date due to a public holiday, then the risk model from the last business day is used in its place.

Factor Scores: The LGIM factor scores are constructed from a combination of regional and sector z-scores and have a domain between -3 and 3.

A **Factor Tilt portfolio** for Value, Momentum, Low Volatility, and Quality is first calculated by tilting the Free Float Market Capitalization of each security as:

$$\overline{w_i} = w_{b,i} * (1 + \frac{1}{3}\text{Factor Score}_i)^k$$

where:

- w_i is the weight of security i in the Factor Tilt Portfolio
- $w_{b,i}$ is the weight of security i in the Parent Index
- Factor Score is the L&G Style Factor z-score for the i^{th} factor
- k is the tilt strength

The tilt strength k starts at 2 and is incremented by one until the Active Share of the Factor Tilt Portfolio vs the parent index is equal to, or higher than, 40%.

The Multifactor score is constructed as a weighted average of the Value, Momentum, Low Volatility, and Quality factor scores, where the weight of each factor score is the scaled inverse ex-ante TE of its tilt portfolio from the parent index, based on the formula below:

$$\Theta_i = \left(\frac{\frac{1}{\sigma_i}}{\sum_j \frac{1}{\sigma_j}} \right), i = 1, \dots, 4,$$

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where $\sigma_i = \sqrt{(\overline{w} - b)\hat{}T\ Q(\overline{w} - b)}$ is the ex-ante TE of the ith factor tilt portfolio from the parent index, where w and b denote the portfolio and benchmark weights, respectively and Q is the covariance matrix associated with the regional Axioma risk model.

The Multifactor score is then calculated as

$$\text{Multifactor score} = \sum_i \Theta_i * \text{Factor score for the ith factor},$$

where Θ_i is the weight applied to the ith factor score in each region.

The **ESG Tilt Portfolio** is next constructed by tilting the Free Float Market Capitalization of each security as described below:

$$\overline{w}_{ESG,i} = w_{b,i} * (1 + ESG\ Score_i)$$

where:

- w_i is the weight of security i in the ESG Tilt Portfolio
- $w_{b,i}$ is the weight of security i in the Parent Index
- $ESG\ Score_i$ is the [-1,1] L&G ESG Score for security i.

Second, the **Multifactor ESG Tilt Portfolio** is then constructed by tilting the weight of each security in the ESG Tilt Portfolio as:

$$\overline{w_i} = \overline{w}_{ESG,i} * (1 + \frac{1}{3} Multifactor\ Score_i)^k$$

where:

- w_i is the weight of security i in the Factor Tilt Portfolio
- $w_{ESG,i}$ is the weight of security i in the ESG Tilt Portfolio
- $\text{Multifactor Score}_i$ is the L&G Multifactor score for asset i
- k is the tilt strength.

The tilt strength k starts at 2 and increases until the Active Share of the Factor Tilt Portfolio vs the parent index is equal to, or higher than, 40%.

Third, the Multifactor ESG optimized factor portfolio is constructed by minimizing the following objective function:

$$\sum_i |w_i - \overline{w_i}| + 0.1 \sqrt{\sum_i (w_i - \overline{w_i})^2}$$

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where w_i and $\overline{w_i}$ are the optimized and Multifactor ESG tilt portfolio weights for the ith asset. The first term minimizes the active share of the optimized portfolio to the Multifactor ESG tilt portfolio. The 2nd term minimizes the sum of squares distance of optimized portfolio to the Multifactor ESG tilt portfolio – it regularizes the objective function and ensures that the portfolio model has a unique solution.

The portfolio model also includes the following constraints to ensure diversification and control for unintended systematic exposures and tradability.

Do Not Hold (Exclusions)	Bottom 5% market cap with lowest factor exposure
	LGIM FWPL
Min Industry Exposure	50% of Parent Index
Active Industry Bounds	+/-5% ICB Industries (Level 1)
Active High Emitting Industry Bounds	+/-6% ICB Industries (Level 1)
Active Country Bounds	+/- 5% (STOXX Country)
Active Untargeted Style Exposures	+/- 0.25 std except targeted style factors
Liquidity	Percentile Days to Trade
Turnover	30% Annual one-way
Ex-ante Tracking Error	3.5%
Max Asset Weight	20x Parent Index Weight
Max Active Asset Weight Bound	+ 3%
Min Active Asset Weight of Low Emitters	- 3%
Min Active Asset Weight of High Emitters	max (Relative Carbon Intensity Target x Parent Index Weight, 0.01%)
Max Total Weight of Top 10 Holdings	1.5 x Total Weight of Parent Index Top 10 Holdings
UCITS	4.5%/8%/35%
Limit Transaction Cost	Annualized TC should be below LGIM's regional bound.
Max Active Share to Parent Index	40%
Max Active Share to Multifactor ESG Tilt Portfolio	15%
Equal Factor Active Risk contribution	-
Minimum Scope 1+2 GHG intensity reduction compared to the Parent Index	50% vs parent index
Year-on-year decarbonization per annum relative to the parent index levels at base date 22 March 2021.	7% annual reduction applied in a geometric progression on 50% of the parent index levels on 22 March 2021.

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ESG Score Improvement	5%

A brief description of the LGIM ESG scores and FWPL exclusions is given below:

LGIM ESG score: Rules-based environmental, social, and governance (ESG) scores from Legal & General Investment Management Limited (LGIM). The scores have been created and used for the following purposes:

1. To improve market standards globally and monitor ESG developments using quantitative measures.
2. To incentivize companies to improve their ESG profile through a transparent methodology.
3. To create investment solutions that are alternatively weighted to give more emphasis to companies that have higher ESG scores.

The LGIM ESG score combines an environment E score, a social S score, and a governance G score, with adjustments made for a company's overall levels of transparency T with regards to ESG issues. The scores can be downloaded from the LGIM ESG score website.

LGIM Future World Protection List (FWPL) Exclusions: The Future World Protection List includes companies that meet any of the following criteria:

1. **Involvement in the manufacture and production of controversial weapons:** Antipersonnel landmines, cluster munitions, biological and chemical weapons – evidence of involvement in the core weapons system.
2. **Perennial violator of the United Nations Global Compact (UNGC), an initiative to encourage businesses worldwide to adopt sustainable and socially responsible policies:** Companies assessed as being in violation of one or more principles for a period of 36-months or more.
3. **Involvement in mining and extraction of thermal coal, thermal-coal power generation and oil sands:** Companies generating 20% or more revenues from these activities.

The methodology is formally reviewed on an annual basis by the LGIM Investment Stewardship team. More details can be found at LGIM Future World Protection Methodology. The exclusions can be downloaded from LGIM Future World Protection List.

FWPL exclusions are applied from December 2018 onwards when the LGIM data is available.

Short descriptions of other data elements used in the Carbon Reduction constraints given below:

Scope 1 and 2 emissions: The GHG Protocol Corporate Standard classifies companies' greenhouse gas (GHG) emissions as direct and indirect emissions[7]. Direct emissions, also known as Scope 1 emissions, refer to GHG waste produced and consumed by the reporting entity. For instance, on-site generation and use of energy is tracked under Scope 1. In contrast, Scope 2 emissions are indirect emissions attributed to the reporting company but generated by another entity. Scope 2 includes acquired/ purchased energy brought into the company's reporting boundary as a form of: electricity, steam, heating, and cooling. Scope 1 and 2 data is obtained from ISS ESG.

Enterprise Value Including Cash (EVIC): EVIC is a measure of a company's total value, often used as a more comprehensive alternative to equity market capitalization. EVIC includes in its calculation the market capitalization of a company, short-term and long-term debt, and any cash on the company's balance sheet. EVIC data used in index construction is based on fiscal year data for the end of the previous calendar year. EVIC is provided in EUR.

[7] https://ghgprotocol.org/sites/default/files/standards/Scope%202%20Guidance_Final_Sept26.pdf

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A brief description of the portfolio constraints is given below:

Low Factor Exposure Exclusions: Do not hold the bottom 5% of stocks by market capitalization with the lowest targeted style factor exposure.

Minimum Industry Exposure: The percentage exposure to each ICB Industry must be at least half of the Parent Index.

Active Industry Weights: The percentage exposure to each ICB Industry must be within +/- 5% of the Parent Index. An exception is applied for industries which have a Carbon Intensity greater than 50% of the Parent Index Carbon Intensity. Their weight deviation is +/- 6%.

Active Country Weights: The percentage exposure to each country must be within +/- 5% of the Parent Index value. Each company's country assignment is based on the STOXX Country classification.

Active Untargeted Style Exposures: The exposure to each of the untargeted LGIM factors as well as the Axioma Risk Model style factors must be within 0.25 standard deviations of the Parent Index's factor exposures.

Limit turnover: The Index has an annual one-way turnover limit of 30%.

Active Risk: The active risk of the index relative to the Parent Index is constrained to a maximum of 3.5%.

Maximum Asset Weight: Restricted to 20 times its weight in the Parent Index.

Asset Holding Limits: The maximum weight of each asset in the index is +/- 3% of its weight in the Parent Index. An exception is applied to securities with a Carbon Intensity Contribution of 20% or more of the Parent Index Carbon Intensity. Their weight is floored at the maximum of the Relative Carbon Intensity Target * parent index weight and 0.01%, i.e., the 3% negative deviation to the Index Universe does not apply. Their weight cap, however, remains unchanged.

Carbon Intensity Contribution = Carbon Intensity x Parent Index Weight

Relative Carbon Intensity Target = Index Carbon Intensity Target / Parent Index Carbon Intensity

Maximum Total Weight of Top 10 Holdings: The maximum total weight of the top 10 holdings is limited 1.5 times the total weight of the top 10 holdings in the Parent Index.

UCITS bounds: The maximum weight of each issuer in the index is 8%. The sum of the weights of those issuers above 4.5% cannot exceed 35%. By applying tighter constraints (4.5% / 8% / 35%) than the standard UCITs bounds (5% / 10% / 40%), we reduce the likelihood of breaching UCITs thresholds, and reduce the gravity of the breaches if they occur.

Limit Transaction Costs: Transaction Costs cannot exceed 2.5 bps of the portfolio reference size in each quarterly rebalancing. Stock level transaction cost data is provided by LGIM and is based on stock's region assignment.

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Maximum Active Share to Parent Index: The maximum Active Share of the index is 40% with regards to the Parent Index.

Maximum Active Share to Factor Tilt Portfolio: The maximum Active Share of the index is 15% with regards to the Factor Tilt Portfolio.

Factor Active Risk: Each targeted style factor contributes equally to Active Risk.

Percentile days to trade/liquidity constraint: The maximum weight of each component in the Index is limited to twenty times its 60-day median daily trading volume multiplied by the ratio of benchmark weight and 60-day median daily trading volume of the representative stock p. The representative asset is the 10th percentile of all constituents in the Parent Index when sorted by the ratio of 60-day median trading volume divided by the Parent Index weight.

$$w_k \leq S\, V_k \frac{b_p}{V_p}$$

where:

- w_k is the weight of the k[th] asset in the portfolio
- p = the asset with the 10-th percentile of $\frac{V_k}{b_k}$
- b_k= the weight of the k[th] asset in the benchmark
- V_k= the daily trading volume for the k[th] asset
- S = 20 (Strength)

GHG Intensity (WACI) Reduction: Define security level Weighted Average Carbon Intensity (WACI) as (Scope 1+2 emissions from ISS ESG / Enterprise value including cash (EVIC)). The index is constructed by constraining the portfolio WACI with respect to the Parent Index as follows:

1. **From March 2018, 50% reduction vs parent index:** Enforce a 50% reduction in WACI vs the parent index in each rebalance from March 2018.
2. **From June 2021, 7% YoY decarbonization on 50% of the parent index levels on March 2021:** For each rebalance from June 2021 onwards, the WACI of the index also satisfies the following constraint:

   WACI of index ≤ $(0.93)^{(Number\ of\ quarterly\ rebalancings\ from\ Mar\ 2021/4)}$ × (50% of parent index WACI on March 2021 / Cumulative Inflation Adjustment Factor[8]).

   In calculating the previous year's WACI reduction, the current WACI is multiplied by the enterprise value inflation factor to reflect the effects of inflation in enterprise values as an increasing average enterprise value of the index constituents could lead to an overall WACI reduction when no actual emissions reductions took place.

[8] The enterprise value inflation adjustment factor is computed by dividing the average enterprise value of the index constituents at the end of the calendar year by the average enterprise value of the index constituents at the end of the previous calendar year and has a minimum value of 1.

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LGIM ESG exposures: Each LGIM ESG score is first converted to positive score between [0, 100]. The index targets a 5% improvement over the total ESG exposure of the Parent Index over these positive ESG scores.

Infeasibility Handling: If a solution that satisfies the above constraints cannot be found, the following constraints are relaxed using Axioma's proprietary constraint hierarchy procedure.

1. Maximum Turnover, Percentile days to trade, and Limit Transaction Costs in Level 1, and
2. Active Share to Factor tilt portfolio and Active Asset Weight in Level 2.

Constraints in Level 1 have precedence over the constraints in Level 2 in the amount that they are relaxed (softened).

The constraint hierarchy is set up so that the optimization can find a relaxed solution if necessary. If the optimization is still unable to find a solution after this additional stage of constraint relaxation, the rebalance for the quarter will not take place

Review frequency: The reviews are conducted on a quarterly basis in April, July, October, and January. The implementation is conducted after the close of third Friday in the review months and effective the next trading day. The weighting factors are calculated based on closing prices from the Wednesday before the second Friday of the review month. Weighting factor = (stock's target weight × 1.000.000.000 / closing price of the stock in EUR) rounded to the nearest integer. Only stocks leaving the STOXX World AC Universal All Cap index in the March, June, September, and December reviews will leave the optimized indexes. Stocks leaving the parent index but not the STOXX World AC Universal All Cap index in the March, June, September, and December reviews will remain in the optimized Multifactor ESG indexes.

The review cut-off date for Parent Index and Axioma data is the Wednesday before the second Friday of the review months. LGIM ESG scores and FWPL exclusions are updated twice a year in March and September. The cut-off date LGIM data is the fifth trading day before the end of the months preceding the review months. The cut-off date for ISS ESG data is the end of the month preceding the review month. The cut-off date for EVIC data is the end of the previous calendar year. In the event of no delivery of LGIM data by the end of the first weekday of the review months, prior data will be used for the index review. The underlying announcements are published after the close of the second Friday of the review month.

Missing Data Treatment: Securities missing LGIM Factor Scores and/or ESG scores are assigned the neutral score of 0 where Factor scores are in the range [-3,3] and ESG scores are in the [-1, 1] range. Securities missing ISS carbon emissions and/or EVIC data are assigned a Carbon Intensity score equal to the median Carbon Intensity of the securities' ICB Industry.

4.3.3. ONGOING MAINTENANCE

Replacements: Deleted companies are not replaced.

Fast exit: Applicable

Fast entry: Not applicable.

Spin-offs: Spin-off stocks are not added permanently.

4. iSTOXX L&G SINGLE FACTOR INDICES

Corporate Actions: All components are maintained for corporate actions as outlined in the STOXX calculation guide available on stoxx.com.

Regions: The regions considered, and their construction is detailed below:

Regional Basket	STOXX Regional/Country Index	Axioma Risk Model
North America	STOXX North America Universal - SWNAGV	NA4-MH
Europe ex United Kingdom	STOXX Developed Europe ex UK Universal - SWDEGGV	EU4-MH
United Kingdom	STOXX UK Universal - SWUKGV	EU4-MH
DM APAC ex Japan	STOXX-Developed-Asia-Pacific-ex-Japan-Universal SWDXGV	APxJP4-MH
Japan	STOXX Japan Universal - SWJPGV	JP4-MH

4. iSTOXX L&G SINGLE FACTOR INDICES

4.4. iSTOXX L&G GLOBAL MULTI-FACTOR ESG MONTHLY HEDGED INDEX

4.4.1. OVERVIEW

A currency-hedged index is designed to represent returns for global index investment strategies that involve hedging currency risk, but not the underlying constituent risk. The currency-hedged strategy indices eliminate the risk of currency fluctuations at the cost of potential currency gains.

An investor who will receive a payment in a foreign currency at a future date and expects the domestic (hedged) currency to appreciate against that foreign currency, can enter a forward contract to sell the foreign currency in the future at a predefined exchange rate. If, at the maturity of the forward contract, the domestic currency has appreciated against foreign currency, the investor can make a profit by selling the payment proceeds (in foreign currency) at a lower rate than the one prevailing on the market.

Name of Underlying Indices
iSTOXX L&G Global Multi-Factor ESG Index (Price Return) - SWGMEGB
iSTOXX L&G Global Multi-Factor ESG Index (Net Return) - SWGMEHB
iSTOXX L&G Global Multi-Factor ESG Index (Gross Return) - SWGMEGHB

Index Types and Currencies: Price, Net and Gross Return in GBP.

Base Values and Dates: 1000 as of January 02, 2025.

Dissemination calendar: STOXX Global calendar

Refer the vendor code sheet on the website[9] for the similar list of indices that have been disseminated at 12PM UK for iSTOXX L&G Global Multi-Factor ESG Monthly Hedged Index.

4.4.2. FORMULA BREAKDOWN

The following definitions will be used throughout the methodology:

H_IDX_t = hedged index for day t
UH_IDX_t = unhedged reference index (in hedged currency) for day t
t=0 = last calculation day of preceding month (reset date)
t = day of index calculation / number of calendar days since t=0
T = number of calendar days in current month
C = number of foreign currencies in the unhedged index

[9] www.stoxx.com/documents/stoxxnet/Documents/Resources/Data_Vendor_Codes/vendor_codes_sheet.csv

4. iSTOXX L&G SINGLE FACTOR INDICES

AF_t = notional adjustment factor for day t
$HR_{c,t}$ = hedge ratio of currency c for day t
$HM_{c,t}$ = hedge multiplier of currency c for day t
$FX_{c,t}$ = spot currency rate for day t
$FF_{c,t}$ = 1-month forward currency rate for day t
$IFF_{c,t}$ = interpolated forward currency rate for day t
R_t = return from hedging for day t

All currency rates are expressed as units of foreign currency c per one unit of domestic (hedged) currency.

The adjustment factor AF_t reflects the changes in the notional value to be hedged between the t=0 and t:

$$AF_t = \frac{UH\_IDX_t}{UH\_IDX_0}$$

The hedge ratio $HR_{c,t}$ can be varied to arrive at index portfolios that are over- or under-hedged to varying degrees. Furthermore, it can be used to hedge multi-currency portfolios.

To fully hedge a multi-currency portfolio, the hedge ratio of each currency is calculated as the sum of weights of the securities quoted in that currency multiplied by the hedge multiplier of the currency to over- or under-hedge the multi-currency portfolio:

$$HR_{c,t} = HM_{c,t} \cdot \sum_{i:ccy_i=c} w_{i,t}$$

The hedge multipliers are set to 1 by default unless otherwise specified.

The interpolated forward currency rate $IFF_{c,t}$ corrects the 1-month forward rate – traded with a fixed 1-month maturity – to reflect the progressively closer expiry (t=T) of the hedge. In other words, the interpolated 1-month forward rate linearly converges to the spot rate as t=T approaches:

$$IFF_{c,t} = FX_{c,t} + \left(1 - \frac{t}{T}\right) \cdot (FF_{c,t} - FX_{c,t})$$

From the above definition, it follows that $IFF_{c,0} = FF_{c,0}$ and $IFF_{c,T} = FX_{c,T}$.

For each currency c, the contribution of hedging to the index return is defined as the product of the relevant hedge ratio by the return on the forward currency trade.

For instance, an investor knows in t=0 that she will receive a payment of 1 unit of foreign currency in t=T. She could wait and convert it at the then prevailing spot rate $FX_{c,T}$ and obtain $1/FX_{c,T}$ units of domestic currency. Alternatively, she could enter a forward trade in t=0 to sell the foreign currency in t=T at $FF_{c,0}$, thus obtaining $1/FF_{c,0}$ units of domestic currency.

4. iSTOXX L&G SINGLE FACTOR INDICES

The P&L from the forward trade, as compared to a spot conversion, is thus $P\&L_{C,[0,T]}=\frac{1}{FF_{C,0}}-\frac{1}{FX_{C,T}}$.

By expressing the forward trade P&L as percentage of the payment value in domestic currency in t=0 and rearranging the terms, the returns on the forward trade can be expressed as $\frac{FX_{C,0}}{FF_{C,0}}-\frac{FX_{C,0}}{FX_{C,T}}$.

The expression for forward trade returns can then be generalized as:

$$R_t=\sum_{C=1}^{C} HR_{C,t-1}\cdot\left(\frac{FX_{C,0}}{IFF_{C,t-1}}-\frac{FX_{C,0}}{IFF_{C,t}}\right)$$

In the monthly hedged version, the forward hedge is set up once a month and remains unchanged until the next reset: the currency weights are fixed at each reset, as well as the notional hedge amount.

The monthly currency hedged indices are thus calculated as:

$$H\_IDX_t=H\_IDX_0\cdot\left[\frac{UH\_IDX_t}{UH\_IDX_0}+\sum_{C=1}^{C} HR_{C,0}\cdot\left(\frac{FX_{C,0}}{FF_{C,0}}-\frac{FX_{C,0}}{IFF_{C,t}}\right)\right]$$

The expression can be directly derived from the formula for daily currency hedged indices, by setting $AF_t=AF_0=1$ and $HR_{C,t}=HR_{C,0}\ \forall\ t$.

The expression of the monthly indices can also be rewritten as a function of the previous day's value as:

$$H\_IDX_t=H\_IDX_{t-1}+H\_IDX_0\cdot\frac{UH\_IDX_t-UH\_IDX_{t-1}}{UH\_IDX_0}-H\_IDX_0\cdot AF_0\cdot\sum_{C=1}^{C} HR_{C,0}\cdot\left(\frac{FX_0}{IFF_t}-\frac{FX_0}{IFF_{t-1}}\right)$$

which simplifies to:

$$H\_IDX_t=H\_IDX_{t-1}+H\_IDX_0\cdot\frac{UH\_IDX_t-UH\_IDX_{t-1}}{UH\_IDX_0}-H\_IDX_0\cdot\sum_{C=1}^{C} HR_{C,0}\cdot\left(\frac{FX_0}{IFF_t}-\frac{FX_0}{IFF_{t-1}}\right)$$

5. iSTOXX L&G DEVELOPED WORLD SINGLE-FACTOR INDICES

5.1. iSTOXX L&G DEVELOPED WORLD SINGLE-FACTOR INDICES

5.1.1. OVERVIEW

The iSTOXX L&G Developed World Single-Factor indices are designed to provide exposure to Value, Momentum, Low Volatility and Quality risk-premia factors, where style factor scores are provided by Legal and General Investment Management (LGIM). The indices track the STOXX World regional indices, while ensuring tradability, diversification, and liquidity.

In addition to the standard End of Day pricing, index levels for these indices will also be captured and disseminated at 15:00 GMT / 16:00 CET to facilitate pooled fund pricing in the UK.

Weighting scheme: The indices are weighted according to a two-step approach using tilt and optimization.

Base values and dates: 100 on March 18th, 2002

Index types and currencies: Price, net, and gross return in EUR, GBP, and USD

For a complete list please consult the data vendor code sheet on the website[10]. Customized solutions can be provided upon request.

Dissemination calendar: STOXX Global calendar

Refer to the vendor code sheet on the website[9] for the similar list of indices that have been disseminated at 3PM UK.

5.1.2. INDEX REVIEW

Index Construction: The four factor indices (Value, Quality, Low Volatility, Momentum) cover the Developed Markets and are constructed by combining all the regional iSTOXX L&G Single Factor Indices (refer the above section named 'iSTOXX L&G Single-Factor indices').

Weighting: The four combined factor indices are weighted according to their weight in the individual regional iSTOXX L&G Single Factor Indices. Additionally, the regional weights of each of the final four factor indices are the same as the weights of each corresponding region in STOXX Developed World index.

The regions (as defined in STOXX Developed World regional indices) in consideration are:

- North America
- Developed Europe ex United Kingdom
- Japan
- United Kingdom
- Developed Asia Pacific ex Japan

[10] www.stoxx.com/documents/stoxxnet/Documents/Resources/Data_Vendor_Codes/vendor_codes_sheet.csv

5. iSTOXX L&G DEVELOPED WORLD SINGLE-FACTOR INDICES

5.1.3. ONGOING MAINTENANCE

Replacements: Deleted companies are not replaced.

Fast exit: Not applicable.

Fast entry: Not applicable.

Spin-offs: Spin-offs are not added permanently

Corporate Actions: All components are maintained for corporate actions as outlined in the STOXX calculation guide available on stoxx.com

6. iSTOXX L&G DIVERSIFIED MULTI-FACTOR ESG INDICES

6.1. iSTOXX L&G DIVERSIFIED MULTI-FACTOR ESG INDICES

6.1.1. OVERVIEW

The iSTOXX L&G Diversified Multi-Factor ESG indices are designed to provide regional exposures to Value, Momentum, Low Volatility and Quality risk-premia factors, a greater exposure to the ESG scores provided by LGIM, while achieving sustainable carbon reduction in terms of greenhouse gas emission intensities over time. The indices track the STOXX World regional indices, while ensuring tradability, diversification, and liquidity. The six regional indices are:

Universe: STOXX World regional indices:

- North America
- Developed Europe ex United Kingdom
- Japan
- United Kingdom
- Developed Asia Pacific ex Japan
- Emerging Markets

Weighting scheme: The indices are weighted according to an optimization model

Base values and dates: 100 on March 18th, 2002

Index types and currencies: Price, net, and gross return in EUR, GBP, and USD

Dissemination calendar: STOXX Global calendar

For a complete list of index types, currencies and snapshot indices please consult the data vendor code sheet on the website[11]. Customized solutions can be provided upon request.

6.1.2. INDEX REVIEW

Constituent Selection: The portfolio construction is performed using LGIM's Value, Momentum, Low Volatility, and Quality factor scores and Axioma's portfolio optimization software and risk models.

Axioma Risk Model: The following Axioma Medium-Horizon Fundamental Factor Risk Models are used by region:

Region	Risk Model	Numeraire
North America	NA4-MH	USD
Europe ex UK	EU4-MH	EUR
UK	EU4-MH	GBP
Asia Pacific ex Japan	APxJP4-MH	USD
Japan	JP4-MH	JPY
Emerging Markets	EM4-MH	USD

[11] www.stoxx.com/documents/stoxxnet/Documents/Resources/Data_Vendor_Codes/vendor_codes_sheet.csv

6. iSTOXX L&G DIVERSIFIED MULTI-FACTOR ESG INDICES

If the regional model is not available on a rebalance date due to a public holiday, then the risk model from the last business day is used in its place.

Factor Scores: The LGIM factor scores are constructed from a combination of regional and sector z-scores and have a domain between -3 and 3.

A **Factor Tilt portfolio** for Value, Momentum, Low Volatility, and Quality is calculated by tilting the Free Float Market Capitalization of each security as:

$$\overline{w_i} = w_{b,i} * (1 + \frac{1}{3}\text{Factor Score}_i)^k$$

where:

- $\overline{w_i}$ is the weight of security i in the Factor Tilt Portfolio
- $w_{b,i}$ is the weight of security i in the Parent Index
- Factor Score is the L&G Style Factor z-score for the i^{th} factor
- k is the tilt strength

The tilt strength k starts at 2 and is incremented by one until the Active Share of the Factor Tilt Portfolio vs the parent index is equal to, or higher than, 40%.

A Multifactor score is constructed as a weighted average of the Value, Momentum, Low Volatility, and Quality factor scores, where the weight of each factor score is the scaled inverse ex-ante TE of its tilt portfolio from the parent index, based on the formula below:

$$\Theta_i = \left(\frac{\frac{1}{\sigma_i}}{\sum_j \frac{1}{\sigma_j}} \right), i = 1, \dots, 4,$$

where $\sigma_i = \sqrt{(\overline{w} - b)\text{^}T\ Q(\overline{w} - b)}$ is the ex-ante TE of the ith factor tilt portfolio from the parent index, where w and b denote the portfolio and benchmark weights, respectively and Q is the covariance matrix associated with the regional Axioma risk model.

The Multifactor score is then calculated as

$$\text{Multifactor score} = \sum_i \Theta_i * \text{Factor score for the ith factor,}$$

where Θ_i is the weight applied to the ith factor score in each region.

Adjusted Parent Index: An adjusted parent index is constructed as follows:

Step1: Optimization: Minimize the sum-of-squares deviation from the parent index subject to the following constraints to generate the Adjusted Parent Index Weights:

1) Long-only, fully invested and
2) % of stock specific risk from each issuer is less than Max (2%,(5 / Max(Number of Parent Index Constituents, 100))).

Step 2: Remove LGIM FWPL Exclusions.

6. iSTOXX L&G DIVERSIFIED MULTI-FACTOR ESG INDICES

Step 3: Remove the bottom 5% by market-cap from Step 2 with the lowest Multifactor scores.
Step 4: Rescale the optimized weights from Step 1 proportionally among the remaining constituents so that they sum to 100%.

The **ESG Tilt Portfolio** is next constructed by tilting each security in the Adjusted Parent Index by its ESG Score as described below:

$$\overline{w}_{ESG,i} = w_{b,i} * (1 + ESG\ Score_i)$$

where:

- $\overline{w}_{ESG,i}$ is the weight of security i in the ESG Tilt Portfolio
- $w_{b,i}$ is the weight of security i in the Adjusted Parent Index after exclusions
- $ESG\ Score_i$ is the [-1,1] L&G ESG Score for security i.

A **Diversified Multifactor ESG Tilt Portfolio** is constructed by tilting the weight of each security in the ESG Tilt Portfolio as:

$$\overline{w_i} = \overline{w}_{ESG,i} * (1 + \frac{1}{3} Multifactor\ Score_i)^k$$

where:

- $\overline{w_i}$ is the weight of security i in the Factor Tilt Portfolio
- $w_{ESG,i}$ is the weight of security i in the ESG Tilt Portfolio
- $\text{Multifactor Score}_i$ is the L&G Multifactor score for asset i
- k is the tilt strength.

The tilt strength k starts at 2 and increases until the Active Share of the Factor Tilt Portfolio vs the Adjusted Parent Index is equal to, or higher than, 40%.

The Diversified Multifactor ESG optimized factor portfolio is constructed by minimizing the following objective function:

$$\sum_i |w_i - \overline{w_i}| + 0.1 \sqrt{\sum_i (w_i - \overline{w_i})^2}$$

where w_i and $\overline{w_i}$ are the optimized and Diversified Multifactor ESG tilt portfolio weights for the ith asset. The first term minimizes the active share of the optimized portfolio to the Diversified Multifactor ESG tilt portfolio. The 2nd term minimizes the sum of squares distance of optimized portfolio to the Diversified Multifactor ESG tilt portfolio – it regularizes the objective function and ensures that the portfolio model has a unique solution.

The portfolio model also includes the following constraints to ensure diversification and control for unintended systematic exposures and tradability.

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Do Not Hold (Exclusions)	Bottom 5% market cap of Adjusted Parent Index with lowest factor exposure
	LGIM FWPL
Min Industry Exposure	50% of Parent Index
Active Industry Bounds	+/-5% ICB Industries (Level 1)
Active High Emitting Industry Bounds	+/-6% ICB Industries (Level 1)
Max Active Country Bound	+5% (STOXX Country)
Min Country Bound	Min(Parent Index Country Exposure - 5%, 0.5x Parent Index Country Exposure)
Liquidity	Percentile Days to Trade
Turnover	30% Annual one-way
Max Asset Weight	20x Parent Index Weight
Max Asset Weight (Absolute)	Min(2 x Max(Adjusted Parent Index Weight), Max(Parent Index Weight))
Min Active Asset Weight of Low Emitters	- 3%
Min Active Asset Weight of High Emitters	Max (Relative Carbon Intensity Target x Parent Index Weight, 0.01%)
Max Total Weight of Top 5% Holdings	1.5 x Total Weight of Adjusted Parent Index Top 5% Holdings by count
UCITS	4.5%/8%/35%
Limit Transaction Cost	Annualized TC should be below LGIM's regional bound.
Max Active Share to Adjusted Parent Index	40%
Max Active Share to Diversified Multifactor ESG Tilt Portfolio	15%
Equal Factor Active Risk contribution	vs the regional parent index
Minimum Scope 1+2 GHG intensity reduction compared to the Parent Index	50% vs parent index
Year-on-year decarbonization per annum relative to the parent index levels at base date 22 March 2021.	7% annual reduction applied in a geometric progression on 50% of the parent index levels on 22 March 2021.
ESG Score Improvement	5%

A brief description of the LGIM ESG scores and FWPL exclusions is given below:

LGIM ESG score: Rules-based environmental, social, and governance (ESG) scores from Legal & General Investment Management Limited (LGIM). The scores have been created and used for the following purposes:

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1. To improve market standards globally and monitor ESG developments using quantitative measures.
2. To encourage companies to improve their ESG profile through a transparent methodology.
3. To create investment solutions that are alternatively weighted to give more emphasis to companies that have higher ESG scores.

The LGIM ESG score combines an environment E score, a social S score, and a governance G score, with adjustments made for a company's overall levels of transparency T with regards to ESG issues. The scores can be downloaded from the LGIM ESG score website.

LGIM Future World Protection List (FWPL) Exclusions: The Future World Protection List is comprised of companies that fail to meet LGIM's minimum standards of globally accepted business practices.

The FWPL exclusions can be found here:
https://www.lgim.com/landg-assets/lgim/_document-library/capabilities/future-world-protection-list-public-methodology.pdf

The methodology can be found here:
https://www.lgim.com/landg-assets/lgim/_document-library/capabilities/future-world-protection-list-public-methodology.pdf

The methodology is formally reviewed on an annual basis by the LGIM Investment Stewardship team. More details can be found at LGIM Future World Protection Methodology. The exclusions can be downloaded from LGIM Future World Protection List.

FWPL exclusions are applied from December 2018 onwards when the LGIM data is available.

Short descriptions of other data elements used in the Carbon Reduction constraints given below:

Scope 1 and 2 emissions: The GHG Protocol Corporate Standard classifies companies' greenhouse gas (GHG) emissions as direct and indirect emissions[12]. Direct emissions, also known as Scope 1 emissions, refer to GHG waste produced and consumed by the reporting entity. For instance, on-site generation and use of energy is tracked under Scope 1. In contrast, Scope 2 emissions are indirect emissions attributed to the reporting company but generated by another entity. Scope 2 includes acquired/ purchased energy brought into the company's reporting boundary as a form of: electricity, steam, heating, and cooling. Scope 1 and 2 data is obtained from ISS ESG.

Enterprise Value Including Cash (EVIC): EVIC is a measure of a company's total value, often used as a more comprehensive alternative to equity market capitalization. EVIC includes in its calculation the market capitalization of a company, short-term and long-term debt, and any cash on the company's balance sheet. EVIC data used in index construction is based on fiscal year data for the end of the previous calendar year. EVIC is provided in EUR.

A brief description of the portfolio constraints is given below:

Low Factor Exposure Exclusions: Do not hold the bottom 5% of stocks by market capitalization with the lowest targeted style factor exposure.

[12] https://ghgprotocol.org/sites/default/files/standards/Scope%202%20Guidance_Final_Sept26.pdf

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Minimum Industry Exposure: The percentage exposure to each ICB Industry must be at least half of the Parent Index.

Active Industry Weights: The percentage exposure to each ICB Industry must be within +/- 5% of the Parent Index. An exception is applied for industries which have a Carbon Intensity greater than 50% of the Parent Index Carbon Intensity. Their weight deviation is +/- 6%.

Country Weights: The max percentage active exposure to each country must be within +5% of the Parent Index value. The min percentage total exposure to each country is Min(Parent Country Exposure – 5%, 0.5 x Parent Country Exposure). Each company's country assignment is based on the STOXX Country classification.

Limit turnover: The Index has an annual one-way turnover limit of 30%.

Maximum Asset Weight: Restricted to Min(20 x Parent Weight, Min(2 x Max(Adjusted Parent Index weight), Max(Parent index weight))) and 20 times the weight of each stock in the regional parent index.

Minimum Asset Weight: The minimumweight of each asset in the index is - 3% of its weight in the Parent Index. An exception is applied to securities with a Carbon Intensity Contribution of 20% or more of the Parent Index Carbon Intensity. Their weight is floored at the maximum of the Relative Carbon Intensity Target * parent index weight and 0.01%, i.e., the 3% negative deviation to the Index Universe does not apply. Their weight cap, however, remains unchanged.

Carbon Intensity Contribution = Carbon Intensity x Parent Index Weight

Relative Carbon Intensity Target = Index Carbon Intensity Target / Parent Index Carbon Intensity

Maximum Total Weight of Top 5% Holdings: The maximum total weight of the top 5% (by count) holdings is limited to 1.5 times the total weight of the top 5% holdings in the Adjusted Parent Index.

UCITS bounds: The maximum weight of each issuer in the index is 8%. The sum of the weights of those issuers above 4.5% cannot exceed 35%. By applying tighter constraints (4.5% / 8% / 35%) than the standard UCITs bounds (5% / 10% / 40%), we reduce the likelihood of breaching UCITs thresholds and reduce the gravity of the breaches if they occur.

Limit Transaction Costs: Transaction Costs cannot exceed the bounds mentioned in the table below of the portfolio reference size in each quarterly rebalancing. Stock level transaction cost data is provided by LGIM and is based on stock's region assignment.

Region	Annual cost (bps)
North America	1
Europe ex UK	5
UK	10
Asia Pacific ex Japan	5
Japan	2

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Emerging markets	7

Maximum Active Share to Adjusted Parent Index: The maximum Active Share of the index is 40% with regards to the Adjusted Parent Index.

Maximum Active Share to Factor Tilt Portfolio: The maximum Active Share of the index is 15% with regards to the Diversified Multifactor ESG Tilt Portfolio.

Factor Active Risk: Each targeted style factor contributes equally to Active Risk.

Percentile days to trade/liquidity constraint: The maximum weight of each component in the Index is limited to twenty times its 60-day median daily trading volume multiplied by the ratio of benchmark weight and 60-day median daily trading volume of the representative stock p. The representative asset is the 10th percentile of all constituents in the Parent Index when sorted by the ratio of 60-day median trading volume divided by the Parent Index weight.

$$w_k \leq S\, V_k \frac{b_p}{V_p}$$

where:

- w_k is the weight of the k[th] asset in the portfolio
- p = the asset with the 10-th percentile of $\frac{V_k}{b_k}$
- b_k= the weight of the k[th] asset in the benchmark
- V_k= the daily trading volume for the k[th] asset
- S = 20 (Strength)

GHG Intensity (WACI) Reduction: Define security level Weighted Average Carbon Intensity (WACI) as (Scope 1+2 emissions from ISS ESG / Enterprise value including cash (EVIC)). The index is constructed by constraining the portfolio WACI with respect to the Parent Index as follows:

1. **From March 2018, 50% reduction vs parent index:** Enforce a 50% reduction in WACI vs the parent index in each rebalance from March 2018.
2. **From June 2021, 7% YoY decarbonization on 50% of the parent index levels on March 2021:** For each rebalance from June 2021 onwards, the WACI of the index also satisfies the following constraint:

   WACI of index ≤ $(0.93)^{(Number\ of\ quarterly\ rebalancings\ from\ Mar\ 2021/4)}$ × (50% of parent index WACI on March 2021 / Cumulative Inflation Adjustment Factor[13]).

   In calculating the previous year's WACI reduction, the current WACI is multiplied by the enterprise value inflation factor to reflect the effects of inflation in enterprise values as an increasing average enterprise value of the index constituents could lead to an overall WACI reduction when no actual emissions reductions took place.

[13] The enterprise value inflation adjustment factor is computed by dividing the average enterprise value of the index constituents at the end of the calendar year by the average enterprise value of the index constituents at the end of the previous calendar year and has a minimum value of 1.

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LGIM ESG exposures: Each LGIM ESG score is first converted to positive score between [0, 100]. The index targets a 5% improvement over the total ESG exposure of the Parent Index over these positive ESG scores.

Infeasibility Handling: If a solution that satisfies the above constraints cannot be found, the following constraints are relaxed using Axioma's proprietary constraint hierarchy procedure.

1. Max Asset Weight (Absolute)
2. Turnover, Percentile days to trade, Min Industry Exposure and Limit Transaction Costs
3. Active Share to Factor tilt portfolio, Active Share to Adjusted Parent Index, Active Industry and Active High Emitting Industry

Constraints in Level 1 have precedence over the constraints in Level 2 and 3 in the amount that they are relaxed (softened).

The constraint hierarchy is set up so that the optimization can find a relaxed solution if necessary. If the optimization is still unable to find a solution after this additional stage of constraint relaxation, the rebalance for the quarter will not take place

Review frequency: The reviews are conducted on a quarterly basis in April, July, October, and January. The implementation is conducted after the close of third Friday in the review months and effective the next trading day. The weighting factors are calculated based on closing prices from the Wednesday before the second Friday of the review month. Weighting factor = (stock's target weight × 1.000.000.000 / closing price of the stock in EUR) rounded to the nearest integer. Only stocks leaving the STOXX World AC Universal All Cap index in the March, June, September, and December reviews will leave the optimized indexes.

The review cut-off date for Parent Index and Axioma data is the Wednesday before the second Friday of the review months. LGIM ESG scores and FWPL exclusions are updated twice a year in March and September. The cut-off date LGIM data is the fifth trading day before the end of the months preceding the review months. The cut-off date for ISS ESG data is the end of the month preceding the review month. The cut-off date for EVIC data is the end of the previous calendar year. In the event of no delivery of LGIM data by the end of the first weekday of the review months, prior data will be used for the index review. The underlying announcements are published after the close of the second Friday of the review month.

Missing Data Treatment: Securities missing LGIM Factor Scores and/or ESG scores are assigned the neutral score of 0 where Factor scores are in the range [-3,3] and ESG scores are in the [-1, 1] range. Securities missing ISS carbon emissions and/or EVIC data are assigned a Carbon Intensity score equal to the median Carbon Intensity of the securities' ICB Industry.

6.1.3. ONGOING MAINTENANCE

Replacements: Deleted companies are not replaced.

Fast exit: Not Applicable

Fast entry: Not applicable.

Spin-offs: Spin-off stocks are not added permanently.

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Corporate Actions: All components are maintained for corporate actions as outlined in the STOXX calculation guide available on stoxx.com.

Regions: The regions considered, and their construction is detailed below:

Regional Basket	STOXX Regional/Country Index	Axioma Risk Model
North America	STOXX North America Universal - SWNAGV	NA4-MH
Europe ex United Kingdom	STOXX Developed Europe ex UK Universal - SWDEGGV	EU4-MH
United Kingdom	STOXX UK Universal - SWUKGV	EU4-MH
DM APAC ex Japan	STOXX-Developed-Asia-Pacific-ex-Japan-Universal SWDXGV	APxJP4-MH
Japan Emerging Markets	STOXX Japan Universal - SWJPGV STOXX Emerging Markets Universal - SWEGV	JP4-MH EM4-MH

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6.2. iSTOXX L&G DIVERSIFIED MULTI-FACTOR ESG MONTHLY HEDGED INDICES

6.2.1. OVERVIEW

A currency-hedged index is designed to represent returns for global index investment strategies that involve hedging currency risk, but not the underlying constituent risk. The currency-hedged strategy indices eliminate the risk of currency fluctuations at the cost of potential currency gains.

An investor who will receive a payment in a foreign currency at a future date and expects the domestic (hedged) currency to appreciate against that foreign currency, can enter a forward contract to sell the foreign currency in the future at a predefined exchange rate. If, at the maturity of the forward contract, the domestic currency has appreciated against foreign currency, the investor can make a profit by selling the payment proceeds (in foreign currency) at a lower rate than the one prevailing on the market.

Hedging exposure is calculated on the last calculation date of each month.

Name of Underlying Indices
iSTOXX L&G North America Diversified Multi-Factor ESG
iSTOXX L&G Developed Europe ex UK Diversified Multi-Factor ESG
iSTOXX L&G Developed APAC ex Japan Diversified Multi-Factor ESG
iSTOXX L&G Japan Diversified Multi-Factor ESG

Base values and dates: 1000 on 01 November 2021

Index types and currencies: Price, net, and gross return in GBP

Dissemination calendar: STOXX Global calendar

Refer the vendor code sheet on the website[14] for the similar list of indices that have been disseminated at 12PM UK.

6.2.2. FORMULA

The following definitions will be used throughout the methodology:

H_IDX_t	Hedged index for day t.
UH_IDX_t	Unhedged reference index (in hedged currency) for day t.
$t=0$	Last calculation day of preceding month (reset date).
t	Day of index calculation / number of calendar days since $t=0$.

[14] www.stoxx.com/documents/stoxxnet/Documents/Resources/Data_Vendor_Codes/vendor_codes_sheet.csv

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T	Number of calendar days in current month.
C	Number of foreign currencies in the unhedged index.
AF_t	Notional adjustment factor for day t.
$HR_{c,t}$	Hedge ratio of currency c for day t.
$HM_{c,t}$	Hedge multiplier of currency c for day t.
$FX_{c,t}$	Spot currency rate for day t.
$FF_{c,t}$	1-month forward currency rate for day t.
$IFF_{c,t}$	Interpolated forward currency rate for day t.
R_t	Return from hedging for day t.

All currency rates are expressed as units of foreign currency c per one unit of domestic (hedged) currency.

The adjustment factor AF_t reflects the changes in the notional value to be hedged between the $t=0$ and t:

$$AF_t = \frac{UH\_IDX_t}{UH\_IDX_0}$$

The hedge ratio $HR_{c,t}$ can be varied to arrive at index portfolios that are over- or under-hedged to varying degrees. Furthermore, it can be used to hedge multi-currency portfolios

To fully hedge a multi-currency portfolio, the hedge ratio of each currency is calculated as the sum of weights of the securities quoted in that currency multiplied by the hedge multiplier of the currency to over- or under-hedge the multi-currency portfolio:

$$HR_{c,t} = HM_{c,t} \cdot \sum_{i:ccy_i=c} w_{i,t}$$

The hedge multipliers are set to 1 by default unless otherwise specified.

The interpolated forward currency rate $IFF_{c,t}$ corrects the 1-month forward rate – traded with a fixed 1-month maturity – to reflect the progressively closer expiry $(t=T)$ of the hedge. In other words, the interpolated 1-month forward rate linearly converges to the spot rate as $t=T$ approaches:

$$IFF_{c,t} = FX_{c,t} + \left(1 - \frac{t}{T}\right) \cdot \left(FF_{c,t} - FX_{c,t}\right)$$

From the above definition, it follows that $IFF_{c,0} = FF_{c,0}$ and $IFF_{c,T} = FX_{c,T}$.

For each currency c, the contribution of hedging to the index return is defined as the product of the relevant hedge ratio by the return on the forward currency trade.

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For instance, an investor knows in $t=0$ that she will receive a payment of 1 unit of foreign currency in $t=T$. She could wait and convert it at the then prevailing spot rate $FX_{c,T}$ and obtain $1/FX_{c,T}$ units of domestic currency. Alternatively, she could enter a forward trade in $t=0$ to sell the foreign currency in $t=T$ at $FF_{c,0}$, thus obtaining $1/FF_{c,0}$ units of domestic currency.
The P&L from the forward trade, as compared to a spot conversion, is thus $P\&L_{c,[0,T]}=\frac{1}{FF_{c,0}}-\frac{1}{FX_{c,T}}$.

By expressing the forward trade P&L as percentage of the payment value in domestic currency in $t=0$ and rearranging the terms, the returns on the forward trade can be expressed as

$$\frac{FX_{c,0}}{FF_{c,0}}-\frac{FX_{c,0}}{FX_{c,T}}.$$

The expression for forward trade returns can then be generalized as:

$$R_t=\sum_{c=1}^{C} HR_{c,t-1}\cdot\left(\frac{FX_{c,0}}{IFF_{c,t-1}}-\frac{FX_{c,0}}{IFF_{c,t}}\right)$$

In the monthly hedged version, the forward hedge is set up once a month and remains unchanged until the next reset: the currency weights are fixed at each reset, as well as the notional hedge amount.

The monthly currency hedged indices are thus calculated as:

$$H\_IDX_t=H\_IDX_0\cdot\left[\frac{UH\_IDX_t}{UH\_IDX_0}+\sum_{c=1}^{C} HR_{c,0}\cdot\left(\frac{FX_{c,0}}{FF_{c,0}}-\frac{FX_{c,0}}{IFF_{c,t}}\right)\right]$$

The expression can be directly derived from the formula for daily currency hedged indices, by setting $AF_t=AF_0=1$ and $HR_{c,t}=HR_{c,0}\ \forall\ t$.

The expression of the monthly indices can also be rewritten as a function of the previous day's value as:

$$H\_IDX_t=H\_IDX_{t-1}+H\_IDX_0\cdot\frac{UH\_IDX_t-UH\_IDX_{t-1}}{UH\_IDX_0}-H\_IDX_0\cdot AF_0\cdot\sum_{c=1}^{C} HR_{c,0}\cdot\left(\frac{FX_0}{IFF_t}-\frac{FX_0}{IFF_{t-1}}\right)$$

Which simplifies to:

$$H\_IDX_t=H\_IDX_{t-1}+H\_IDX_0\cdot\frac{UH\_IDX_t-UH\_IDX_{t-1}}{UH\_IDX_0}-H\_IDX_0\cdot\sum_{c=1}^{C} HR_{c,0}\cdot\left(\frac{FX_0}{IFF_t}-\frac{FX_0}{IFF_{t-1}}\right)$$