MSCI EUROPE EQUAL RISK CONTRIBUTION (ERC) INDEX METHODOLOGY

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1 INTRODUCTION

The MSCI Europe ERC Index is calculated by optimizing the parent MSCI Europe Index to produce an index where the securities are assigned weights such that each security contributes equally to the ex-ante risk of the Index at the time of rebalancing.

2 INDEX CONSTRUCTION METHODOLOGY

The applicable universe includes all the existing constituents of the underlying MSCI Europe Index (herein, "Parent Index"). The MSCI Europe ERC Index is constructed by optimizing the Parent Index in conjunction with the GEM2S Barra Equity Model to achieve risk parity among the constituents of the Index. The optimization is performed using EUR as the base currency.

The steps for constructing the MSCI Europe ERC Index are described below.

2.1 ELIGIBLE UNIVERSE

All the securities from the Parent Index are part of the eligible universe. The optimization relies on the factor exposures for all the securities in the Parent Index and the factor covariance matrix of the GEM2S Barra Equity Model.

2.2 SECURITY SELECTION

All the securities from the eligible universe are included in the MSCI Europe ERC Index with weights determined by the optimization.

2.3 WEIGHTING SCHEME

The securities selected in the previous step are assigned weights through the process of optimization.

The optimization objective is to set risk parity among the constituents of the MSCI Europe ERC Index.

The Index aims to equalize the ex-ante risk contribution from each constituent in the Parent Index. The risk contribution of the security is the share of ex-ante index risk attributable to that security. It is computed as the product of the weight of the security in the index and its ex-ante marginal risk contribution. The ex-ante risk estimates are derived from the GEM2S Barra Equity Model.

$$RC_i = w_i * MCR_i$$

where,

- RC_i = Risk Contribution of security *i*
- w_i = weight of security *i* in the MSCI Europe ERC Index
- MCR_i = Marginal Contribution to the index Risk for security *i*

The optimization objective is

$$RC_1 = RC_2 \dots \dots = RC_n = k$$

where k is the ratio of ex-ante index risk to the number of securities in the applicable universe. The only optimization constraint applied is to establish risk parity among all the securities from the Parent Index.

In case of an infeasible optimization during the construction or rebalancing of the MSCI Europe ERC Index, please refer to Appendix I.

3 MAINTAINING THE INDEX

3.1 QUARTERLY INDEX REVIEWS

The MSCI Europe ERC Index is rebalanced on a quarterly basis coinciding with the Quarterly Index Reviews (QIRs) of the MSCI Global Investable Market Indexes, usually as of the close of the last business day of February, May, August and November,. GEM2S Barra Equity Model data as of the end of January, April, July and October are used respectively. The pro forma MSCI Europe ERC Index is announced nine business days before the effective date.

3.2 ONGOING EVENT RELATED CHANGES

The general treatment of corporate events in the MSCI Europe ERC Indexes aims to minimize turnover outside of Index Reviews. The methodology aims to appropriately represent an investor's participation in an event based on relevant deal terms and pre-event weighting of the index constituents that are involved. Further, changes in index market capitalization that occur as a result of corporate event implementation will be offset by a corresponding change in the Variable Weighting Factor (VWF) of the constituent.

Additionally, if the frequency of Index Reviews in the Parent Index is greater than the frequency of Index Reviews in the MSCI Europe ERC Index, the changes made to the Parent Index during intermediate Index Reviews will be neutralized in the MSCI Europe ERC Index.

The following section briefly describes the treatment of common corporate events within the MSCI Europe ERC Indexes.

No new securities will be added (except where noted below) to the Index between Index Reviews. Parent Index deletions will be reflected simultaneously.

EVENT TYPE	EVENT DETAILS
New additions to the Parent Index	A new security added to the parent index (such as IPO and other early inclusions) will not be added to the index.
Spin-Offs	All securities created as a result of the spin-off of an existing Index constituent will be added to the Index at the time of event implementation. Reevaluation for continued inclusion in the Index will occur at the subsequent Index Review.

Merger/Acquisition	For Mergers and Acquisitions, the acquirer's post event weight will account for the proportionate amount of shares involved in deal consideration, while cash proceeds will be invested across the Index. If an existing Index constituent is acquired by a non-Index constituent, the existing constituent will be deleted from the Index and the acquiring non-constituent will not be added to the Index.
Changes in Security Characteristics	A security will continue to be an Index constituent if there are changes in characteristics (country, sector, size segment, etc.) Reevaluation for continued inclusion in the Index will occur at the subsequent Index Review.

Further detail and illustration regarding specific treatment of corporate events relevant to this Index can be found in the MSCI Corporate Events Methodology book under the sections detailing the treatment of events in Capped Weighted and Non-Market Capitalization Weighted indexes.

The MSCI Corporate Events methodology book is available at:
https://www.msci.com/index-methodology

APPENDIX I: HANDLING INFEASIBLE OPTIMIZATIONS

During the index review, in the event that there is no optimal solution that satisfies the optimization constraints defined in Section 2, the optimization-based risk parity solution will be deemed infeasible. In such a scenario, all the securities in the Parent Index will be assigned the weights in the inverse proportion of their volatility (σ). The volatility of the security is the standard deviation computed using weekly returns over three years prior to the rebalancing date. The volatility will be determined in accordance with the methodology for MSCI Risk Weighted Indexes (Section 2.3). The methodology book is available at

https://www.msci.com/index-methodology

The following sections have been modified since December 2014:

- The details on the Corporate Events treatment are now included in Section 3.2.

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