

MSCI DECREMENT INDEXES METHODOLOGY

November 2018

CONTENTS

- 1 Introduction 3
- 2 Constructing the MSCI Decrement Indexes 4
 - 2.1 Overview 4
 - 2.2 Decrement Type Selection 4
 - 2.2.1 Decrement Type.....4
 - 2.2.2 Decrement Application4
 - 2.2.3 Decrement Time and Frequency.....5
 - 2.2.4 Currency of Calculation.....5
 - 2.2.5 Day Count Convention5
 - 2.3 Exception Handling..... 5
 - 2.4 Decrement Calculation Formulae 6
 - 2.4.1 Fixed Percentage Decrement.....6
 - 2.4.2 Fixed Index Point Decrement.....7
 - 2.4.3 Incremental Index Point Decrement: Compounded Growth.....8
 - 2.4.4 Incremental Index Point Decrement: Multiplicative Growth9
- 3 Maintaining the MSCI Decrement Indexes 10

1 INTRODUCTION

The MSCI Decrement Indexes (“Indexes”) are designed to represent the performance of a strategy tracking a given MSCI index (parent) from which a pre-determined amount (a ‘synthetic dividend’) is withdrawn periodically. In most cases, the parent index will be a net or gross total return index, which captures the share price movement as well as incorporates the dividends paid by the companies in the index.

Due to the synthetic dividend deducted from these indexes, the decrement version will systematically underperform its parent index. As a result, decrement indexes are not suitable for financial products that solely aim to replicate the performance of the index.

2 CONSTRUCTING THE MSCI DECREMENT INDEXES

2.1 OVERVIEW

The MSCI Decrement Indexes are designed to represent the performance of a strategy tracking a given MSCI index from which a pre-determined amount (‘synthetic dividend’) is withdrawn at pre-defined intervals. MSCI calculates the MSCI Decrement Indexes based upon any given MSCI index (“Parent Index”).

2.2 DECREMENT TYPE SELECTION

The MSCI Decrement Indexes are calculated in different ways, depending on the choice of:

- Decrement type
- Decrement application
- Decrement frequency
- Currency of calculation
- Day-count convention

2.2.1 DECREMENT TYPE

Decrement Indexes apply a constant or relative performance deduction to the underlying index on a periodic basis. The mark down method used for the construction of MSCI Decrement Indexes is one of the following:

- Fixed Percentage Decrement: A constant percentage of the Parent Index performance is deducted at a pre-defined interval.
- Fixed Index Points Decrement: A constant number of index points are deducted from Parent Index levels at a pre-defined interval.
- Incremental Index Points Decrement: The index points deduction, to be applied to the Parent Index levels, is time-varying with a pre-defined growth rate.

2.2.2 DECREMENT APPLICATION

The algorithm to deduct the decrement types as defined in section 2.2.1 is either:

- Arithmetic Application: The decrement index levels are computed by deducting the index points or percentage points from the underlying Parent Index levels directly.
- Geometric Application: The decrement index replicates the performance of the underlying Parent Index, from which index points or percentage points are subsequently deducted.



2.2.3 DECREMENT TIME AND FREQUENCY

The decrement to the Parent Index may be applied daily, monthly, quarterly, semi-annually or annually.

2.2.4 CURRENCY OF CALCULATION

To calculate decrement indexes in the currency of choice, the Parent Index is first expressed in the target currency and then the decrement is applied to that currency-adjusted Parent Index level. The Decrement Index levels are currency-relative i.e. decrement levels calculated from underlying index expressed in currency A cannot be converted to currency B by simple exchange rate conversion.

2.2.5 DAY COUNT CONVENTION

The day-count convention can either be Actual/360 or Actual/365.

2.3 EXCEPTION HANDLING

As a consequence of a simple decrement application, it is possible that the decrement index level could become negative on a particular day. To guard against this, the decrement is not applied on days when the application of the decrement would otherwise cause the index level to drop to or below zero so that the index levels always remain positive. Alternatively, an index-floor value may be set beyond which the application of the decrement is stopped. Note that the index level may still go below such a floor because of Parent Index performance.

2.4 DECREMENT CALCULATION FORMULAE

The different variations of the decrement application as defined in section 2.2 use different formulas and equations for index level calculations.

2.4.1 FIXED PERCENTAGE DECREMENT

Frequency: Daily

- Geometric Decrement Calculation:

$$DI_t = DI_{t-1} * \left(\frac{U_t}{U_{t-1}} - c \frac{ACT(t-1,t)}{DayCount} \right)$$

- Arithmetic Decrement Calculation:

$$DI_t = DI_{t-1} * (U_t * (1 - c * \frac{ACT(t=0,t)}{DayCount})) / (U_{t-1} * (1 - c * \frac{ACT(t=0,t-1)}{DayCount}))$$

Frequency: Monthly/Quarterly/Semi-Annual/Annual

- Geometric Decrement Calculation:

$$DI_t = DI_{t-1} * \frac{U_t}{U_{t-1}}$$

On non-decrement days

$$DI_t = DI_{t-1} * \left(\frac{U_t}{U_{t-1}} - c \frac{ACT(Q-1,Q)}{DayCount} \right)$$

On decrement days

where c is a specified fixed percentage deduction

Note: The fixed percentage decrement is not available for arithmetic decrement calculations with less frequent adjustments than daily.

2.4.2 FIXED INDEX POINT DECREMENT

Frequency: Daily

- Geometric Decrement Calculation:

$$DI_t = DI_{t-1} * \frac{U_t}{U_{t-1}} - c \frac{ACT(t-1,t)}{DayCount}$$

- Arithmetic Decrement Calculation:

$$DI_t = DI_{t-1} * (U_t - c * \frac{ACT(t=0,t)}{DayCount}) / (U_{t-1} - c * \frac{ACT(t=0,t-1)}{DayCount})$$

Frequency: Monthly/Quarterly/Semi-Annual/Annual

- Geometric Decrement Calculation:

$$DI_t = DI_{t-1} * \frac{U_t}{U_{t-1}}$$

On non-decrement days

$$DI_t = DI_{t-1} * \frac{U_t}{U_{t-1}} - c \frac{ACT(t-1,t)}{DayCount}$$

On decrement days

where c is fixed index points deduction

Note: The fixed index point decrement is not available for arithmetic decrement calculations with less frequent adjustments than daily.

2.4.3 INCREMENTAL INDEX POINT DECREMENT: COMPOUNDED GROWTH

Frequency: Daily growth in index point decrement

- Geometric Decrement Calculation:

$$DI_t = DI_{t-1} * \frac{U_t}{U_{t-1}} - c_t * \frac{ACT(t-1,t)}{DayCount}$$

where:

$$c_t = c_{t-1} (1 + g)^{\frac{ACT(t-1,t)}{DayCount}}$$

g is the rate of growth of decrement per year

Frequency: Monthly/Quarterly/Semi-Annual/Annual growth in index point decrement

- Geometric Decrement Calculation:

$$DI_t = DI_{t-1} * \frac{U_t}{U_{t-1}} - c_t * \frac{ACT(t-1,t)}{DayCount}$$

where:

$$c_t = c_{t-1} \qquad \text{when no growth in decrement}$$

$$c_t = c_{t-1} (1 + g)^{\frac{ACT(Q-1,Q)}{DayCount}} \qquad \text{when applying growth in decrement}$$

g is the rate of growth of decrement per year

c_t is the decrement point to be deducted on day t

Note: Incremental index point decrement with compounded growth is not applicable for arithmetic calculations.

2.4.4 INCREMENTAL INDEX POINT DECREMENT: MULTIPLICATIVE GROWTH

Frequency: Daily

- Geometric Decrement Calculation:

$$DI_t = DI_{t-1} * \frac{U_t}{U_{t-1}} - c_t * \frac{ACT(t-1,t)}{DayCount}$$

where:

$$c_t = c * \max(1, \frac{DI_{t-1}}{DI_{t=0}})$$

c_t is the decrement point to be deducted on day t

Note: Incremental index point decrement with multiplicative growth is only applicable for geometric calculations on daily frequencies.

For all the equations above, we used the following notation:

DI_t = Decrement Index Value on day t

U_t = Index Value of the underlying Parent Index on day t

$ACT(t - 1, t)$ = number of actual calendar days between day t-1 and t (1 over weekdays and 3 over weekends)

$DayCount$ = 360 or 365

Q = Current Month/Quarter/Semi-Annual/Annual end date (or previous business day if Month/Quarter/Semi-Annual/Annual end date coincides with a weekend)

$Q - 1$ = Previous Month/Quarter/Semi-Annual/Annual end date (or previous business day if Month/Quarter/Semi-Annual/Annual end date coincides with a weekend)

3 MAINTAINING THE MSCI DECREMENT INDEXES

The MSCI Decrement Indexes are derived from the existing underlying MSCI Parent Indexes. As a result, corporate events are reflected in the MSCI Decrement Indexes as they occur and as they are captured in the underlying MSCI Parent Indexes.

The following sections have been modified since May 2018:

Update to the Introduction section to explain performance of decrement indexes and clarify their use case.

Update to Section 2.4 (Decrement Calculation Formulae) to clarify formula used in calculation of Decrement Indexes.

CONTACT US AMERICAS

clientservice@msci.com	Americas	1 888 588 4567 *
	Atlanta	+ 1 404 551 3212
	Boston	+ 1 617 532 0920
	Chicago	+ 1 312 675 0545
	Monterrey	+ 52 81 1253 4020
	New York	+ 1 212 804 3901
	San Francisco	+ 1 415 836 8800
	Sao Paulo	+ 55 11 3706 1360
Toronto	+ 1 416 628 1007	

EUROPE, MIDDLE EAST & AFRICA

Cape Town	+ 27 21 673 0100
Frankfurt	+ 49 69 133 859 00
Geneva	+ 41 22 817 9777
London	+ 44 20 7618 2222
Milan	+ 39 02 5849 0415
Paris	0800 91 59 17 *

ASIA PACIFIC

China North	10800 852 1032 *
China South	10800 152 1032 *
Hong Kong	+ 852 2844 9333
Mumbai	+ 91 22 6784 9160
Seoul	00798 8521 3392 *
Singapore	800 852 3749 *
Sydney	+ 61 2 9033 9333
Taipei	008 0112 7513 *
Tokyo	+ 81 3 5290 1555

* = toll free

ABOUT MSCI

For more than 40 years, MSCI’s research-based indexes and analytics have helped the world’s leading investors build and manage better portfolios. Clients rely on our offerings for deeper insights into the drivers of performance and risk in their portfolios, broad asset class coverage and innovative research.

Our line of products and services includes indexes, analytical models, data, real estate benchmarks and ESG research.

For more information, visit us at www.msci.com.

NOTICE AND DISCLAIMER

This document and all of the information contained in it, including without limitation all text, data, graphs, charts (collectively, the “Information”) is the property of MSCI Inc. or its subsidiaries (collectively, “MSCI”), or MSCI’s licensors, direct or indirect suppliers or any third party involved in making or compiling any Information (collectively, with MSCI, the “Information Providers”) and is provided for informational purposes only. The Information may not be modified, reverse-engineered, reproduced or disseminated in whole or in part without prior written permission from MSCI.

The Information may not be used to create derivative works or to verify or correct other data or information. For example (but without limitation), the Information may not be used to create indexes, databases, risk models, analytics, software, or in connection with the issuing, offering, sponsoring, managing or marketing of any securities, portfolios, financial products or other investment vehicles utilizing or based on, linked to, tracking or otherwise derived from the Information or any other MSCI data, information, products or services.

The user of the Information assumes the entire risk of any use it may make or permit to be made of the Information. NONE OF THE INFORMATION PROVIDERS MAKES ANY EXPRESS OR IMPLIED WARRANTIES OR REPRESENTATIONS WITH RESPECT TO THE INFORMATION (OR THE RESULTS TO BE OBTAINED BY THE USE THEREOF), AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, EACH INFORMATION PROVIDER EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES (INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF ORIGINALITY, ACCURACY, TIMELINESS, NON-INFRINGEMENT, COMPLETENESS, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) WITH RESPECT TO ANY OF THE INFORMATION.

Without limiting any of the foregoing and to the maximum extent permitted by applicable law, in no event shall any Information Provider have any liability regarding any of the Information for any direct, indirect, special, punitive, consequential (including lost profits) or any other damages even if notified of the possibility of such damages. The foregoing shall not exclude or limit any liability that may not by applicable law be excluded or limited, including without limitation (as applicable), any liability for death or personal injury to the extent that such injury results from the negligence or willful default of itself, its servants, agents or sub-contractors.

Information containing any historical information, data or analysis should not be taken as an indication or guarantee of any future performance, analysis, forecast or prediction. Past performance does not guarantee future results.

The Information should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions. All Information is impersonal and not tailored to the needs of any person, entity or group of persons.

None of the Information constitutes an offer to sell (or a solicitation of an offer to buy), any security, financial product or other investment vehicle or any trading strategy.

It is not possible to invest directly in an index. Exposure to an asset class or trading strategy or other category represented by an index is only available through third party investable instruments (if any) based on that index. MSCI does not issue, sponsor, endorse, market, offer, review or otherwise express any opinion regarding any fund, ETF, derivative or other security, investment, financial product or trading strategy that is based on, linked to or seeks to provide an investment return related to the performance of any MSCI index (collectively, “Index Linked Investments”). MSCI makes no assurance that any Index Linked Investments will accurately track index performance or provide positive investment returns. MSCI Inc. is not an investment adviser or fiduciary and MSCI makes no representation regarding the advisability of investing in any Index Linked Investments.

Index returns do not represent the results of actual trading of investable assets/securities. MSCI maintains and calculates indexes, but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the index or Index Linked Investments. The imposition of these fees and charges would cause the performance of an Index Linked Investment to be different than the MSCI index performance.

The Information may contain back tested data. Back-tested performance is not actual performance, but is hypothetical. There are frequently material differences between back tested performance results and actual results subsequently achieved by any investment strategy.

Constituents of MSCI equity indexes are listed companies, which are included in or excluded from the indexes according to the application of the relevant index methodologies. Accordingly, constituents in MSCI equity indexes may include MSCI Inc., clients of MSCI or suppliers to MSCI. Inclusion of a security within an MSCI index is not a recommendation by MSCI to buy, sell, or hold such security, nor is it considered to be investment advice.

Data and information produced by various affiliates of MSCI Inc., including MSCI ESG Research LLC and Barra LLC, may be used in calculating certain MSCI indexes. More information can be found in the relevant index methodologies on www.msci.com.

MSCI receives compensation in connection with licensing its indexes to third parties. MSCI Inc.’s revenue includes fees based on assets in Index Linked Investments. Information can be found in MSCI Inc.’s company filings on the Investor Relations section of www.msci.com.

MSCI ESG Research LLC is a Registered Investment Adviser under the Investment Advisers Act of 1940 and a subsidiary of MSCI Inc. Except with respect to any applicable products or services from MSCI ESG Research, neither MSCI nor any of its products or services recommends, endorses, approves or otherwise expresses any opinion regarding any issuer, securities, financial products or instruments or trading strategies and MSCI’s products or services are not intended to constitute investment advice or a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such. Issuers mentioned or included in any MSCI ESG Research materials may include MSCI Inc., clients of MSCI



or suppliers to MSCI, and may also purchase research or other products or services from MSCI ESG Research. MSCI ESG Research materials, including materials utilized in any MSCI ESG Indexes or other products, have not been submitted to, nor received approval from, the United States Securities and Exchange Commission or any other regulatory body.

Any use of or access to products, services or information of MSCI requires a license from MSCI. MSCI, Barra, RiskMetrics, IPD and other MSCI brands and product names are the trademarks, service marks, or registered trademarks of MSCI or its subsidiaries in the United States and other jurisdictions. The Global Industry Classification Standard (GICS) was developed by and is the exclusive property of MSCI and Standard & Poor's. "Global Industry Classification Standard (GICS)" is a service mark of MSCI and Standard & Poor's.

MIFID2/MIFIR notice: MSCI ESG Research LLC does not distribute or act as an intermediary for financial instruments or structured deposits, nor does it deal on its own account, provide execution services for others or manage client accounts. No MSCI ESG Research product or service supports, promotes or is intended to support or promote any such activity. MSCI ESG Research is an independent provider of ESG data, reports and ratings based on published methodologies and available to clients on a subscription basis. We do not provide custom or one-off ratings or recommendations of securities or other financial instruments upon request.

Privacy notice: For information about how MSCI ESG Research LLC collects and uses personal data concerning officers and directors, please refer to our Privacy Notice at <https://www.msci.com/privacy-pledge>.