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# FTSE 100 Minimum Variance Index

v2.3

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## Section 1

# Introduction

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### 1.0 Introduction

- 1.1 This document sets out the Ground Rules for the construction and management of the FTSE 100 Minimum Variance Index calculated by FTSE International Limited (FTSE). Copies of these Ground Rules are available from FTSE Russell.
- 1.2 The FTSE 100 Minimum Variance Index has been designed to create an index in which the objective is to minimise the volatility of the FTSE 100 Index, based on historical return information, thereby offering potential improvements to the risk/reward trade-off of the index.
- 1.3 These Ground Rules should be read in conjunction with the FTSE UK Index Series Ground Rules and the FTSE Russell Corporate Actions and Events Guide for Non Market Capitalisation Weighted Indexes which are available at [www.ftserussell.com](http://www.ftserussell.com).
- 1.4 Price and Total Return Index will be calculated in UK Sterling on a real-time basis. The Total Return Index includes income based on ex dividend adjustments.
- 1.5 **FTSE Russell**
- 1.5.1 FTSE Russell is a trading name of FTSE International Limited, Frank Russell Company, and FTSE TMX Global Debt Capital Markets Limited and its subsidiaries (including MTSNext Limited). FTSE International Limited is the administrator of all FTSE Russell indexes.
- 1.6 FTSE Russell hereby notifies users of the index that it is possible that circumstances, including external events beyond the control of FTSE Russell, may necessitate changes to, or the cessation of, the index and therefore, any financial contracts or other financial instruments that reference the index or investment funds which use the index to measure their performance should be able to withstand, or otherwise address the possibility of changes to, or cessation of, the index.
- 1.7 Index users who choose to follow this index or to buy products that claim to follow this index should assess the merits of the index's rules-based methodology and take independent investment advice before investing their own or client funds. No liability whether as a result of negligence or otherwise is accepted by FTSE Russell for any losses, damages, claims and expenses suffered by any person as a result of:
- any reliance on these Ground Rules, and/or
  - any errors or inaccuracies in these Ground Rules, and/or
  - any non-application or misapplication of the policies or procedures described in these Ground Rules, and/or
  - any errors or inaccuracies in the compilation of the index or any constituent data.



## Section 2

# Management Responsibilities

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## 2.0 Management Responsibilities

### 2.1 FTSE International Limited (“FTSE”)

2.1.1 FTSE is the benchmark administrator of the index.

2.1.2 FTSE is responsible for the daily calculation, production and operation of the FTSE 100 Minimum Variance Index and will:

- maintain records of the index weightings of all constituents and reserve companies;
- make changes to the constituents and their weightings in accordance with the Ground Rules;
- carry out the periodic index reviews of the index and apply the changes resulting from the reviews as required by the Ground Rules;
- publish changes to the constituent weightings resulting from their ongoing maintenance and the periodic reviews;
- disseminate the index.

2.1.3 FTSE is also be responsible for monitoring the performance of the FTSE 100 Minimum Variance Index throughout the day and will determine whether the status of each index should be Firm, Indicative or Held (see Appendix B).

### 2.2 Amendments to these Ground Rules

2.2.1 These Ground Rules shall be subject to regular review by FTSE Russell to ensure that they continue to meet the current and future requirements of investors and other index users. Any proposals for significant amendments to these Ground Rules will be subject to consultation with FTSE Russell advisory committees and other stakeholders if appropriate. The feedback from these consultations will be considered by the FTSE Russell Product Governance Board before approval is granted.

2.2.2 As provided for in the Statement of Principles for FTSE Russell Equity Indexes, where FTSE Russell determines that the Ground Rules are silent or do not specifically and unambiguously apply to the subject matter of any decision, any decision shall be based as far as practical on the Statement of Principles. After making any such determination, FTSE Russell shall advise the market of its decision at the earliest opportunity. Any such treatment will not be considered as an exception or change to the Ground Rules, or to set a precedent for future action, but FTSE Russell will consider whether the Ground Rules should subsequently be updated to provide greater clarity.



## Section 3

# FTSE Russell Index Policies

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### 3.0 FTSE Russell Index Policies

These Ground Rules should be read in conjunction with the following policy documents which can be accessed using the links below:

#### 3.1 Corporate Actions and Events Guide

- 3.2 Full details of changes to constituent companies due to corporate actions and events can be accessed in the Corporate Actions and Events Guide for Non Market Capitalisation Weighted Indexes using the following link:

[Corporate Actions and Events Guide for Non Market Cap Weighted Indices.pdf](#)

#### 3.3 Statement of Principles for FTSE Russell Equity Indexes (the Statement of Principles)

Indexes need to keep abreast of changing markets and the Ground Rules cannot anticipate every eventuality. Where the Ground Rules do not fully cover a specific event or development, FTSE Russell will determine the appropriate treatment by reference to the Statement of Principles which summarises the ethos underlying FTSE Russell's approach to index construction. The Statement of Principles is reviewed annually and any changes proposed by FTSE Russell are presented to the FTSE Russell Policy Advisory Board for discussion before approval by the FTSE Russell Product Governance Board.

The Statement of Principles can be accessed using the following link:

[Statement of Principles](#)

#### 3.4 Queries, Complaints and Appeals

A constituent or prospective constituent company (or professional advisor acting on behalf of the company), a national organisation or a group of no fewer than ten users of the indexes from different organisations acting in their professional capacity may appeal against decisions taken by FTSE Russell.

FTSE Russell's complaints procedure can be accessed using the following link:

[FTSE Russell Benchmark Determination Complaints Handling Policy.pdf](#)

FTSE Russell's Appeal Process can be accessed using the following link:

[Appeals Against Decisions.pdf](#)

### 3.5 **Index Policy for Trading Halts and Market Closures**

Guidance for the treatment of index changes in the event of trading halts or market closures can be found using the following link:

[FTSE Russell Index Policy for Trading Halts and Market Closures.pdf](#)

### 3.6 **Index Policy in the Event Clients are Unable to Trade a Market**

3.6.1 Details of FTSE Russell's treatment can be accessed using the following link:

[FTSE Russell Index Policy in the Event Clients are Unable to Trade a Market.pdf](#)

### 3.7 **Recalculation Policy and Guidelines**

3.7.1 The FTSE 100 Minimum Variance Index is recalculated whenever errors or distortions occur that are deemed to be significant. Users of the FTSE 100 Minimum Variance Index are notified through appropriate media.

For further information refer to the FTSE Russell Recalculation Policy and Guidelines document which is available from the FTSE Russell website using the link below or by contacting

[info@ftserussell.com](mailto:info@ftserussell.com).

[Recalculation Policy and Guidelines Equity Indexes.pdf](#)

### 3.8 **FTSE Russell Policy for Benchmark Methodology Changes**

3.8.1 Details of FTSE Russell's policy for making benchmark methodology changes can be accessed using the following link:

[FTSE Russell Policy for Benchmark Methodology Changes.pdf](#)

## Section 4

# Eligible Securities

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### 4.0 Eligible Securities

- 4.1 The index universe of the FTSE 100 Minimum Variance Index will consist of the constituents from the FTSE 100 Index at the time of the quarterly review.
- 4.2 All aspects of the management of index calculation, constituent review and company classification for constituents of the FTSE 100 Minimum Variance Index are as described in the FTSE UK Index Series Ground Rules.

### 4.3 Weighting Methodology

#### 4.3.1 Covariance Matrix $\Omega$

Returns: Daily arithmetic business day total returns denominated in GBP are used to derive the covariance matrix. These are defined by:

$$r_{i,t} = \frac{e_{i,t} \times (p_{i,t} + d_{i,t})}{e_{i,t-1} \times p_{i,t-1}} - 1$$

where  $e_{i,t}$  is the GBP exchange rate,  $p_{i,t}$  is the adjusted price and  $d_{i,t}$  is the adjusted dividend for the  $i^{th}$  stock at time  $t$ .

The volatility and correlation estimation period is defined by the number of business days in the two years prior to the quarterly review date.

$$\text{Volatility: } \delta_{i,T} = \sqrt{\frac{1}{T_\delta - 1} \sum_{t=T-T_\delta+1}^T (r_{i,t} - \bar{r}_i)^2}$$

where  $T_\delta$  = volatility estimation period (approx 500 to 520 days).

$$\text{Correlation: } \rho_{i,j,T} = \frac{\left[ \frac{1}{(T_\rho - 1)} \sum_{t=T-T_\rho+1}^T (r_{i,t} - \bar{r}_i)(r_{j,t} - \bar{r}_j) \right]}{\delta_{i,T} \delta_{j,T}}$$

where  $T_\rho$  = correlation estimation period (approx 500 to 520 days).

$$\text{Covariance Matrix: } \Omega_{i,j,T} = \delta_{i,T} \delta_{j,T} \rho_{i,j,T}$$

Maximum Proportion of Missing Observations: The maximum proportion of missing return values within the observation period (i.e. 500 to 520 business days for volatility and correlation) is 20%. Stocks not meeting this threshold have their weights set to zero and are not included in the FTSE 100 Minimum Variance Index.

### 4.3.2 Objective Function

Objective: Minimise  $\sigma^2 = \sum_{i=1}^n \sum_{j=1}^n w_i \Omega_{i,j} w_j$

### 4.3.3 Constraints

Weights are determined in order to minimise the volatility of the index, subject to the following constraints:

Upper Stock Limit:  $w_i \leq w_{\max} \quad \forall_i$  where  $w_{\max} = 4.5\%$

Upper ICB Industry Group Sector Limit:  $W_k \leq W_{\max} \quad \forall_k$  where  $W_{\max} = 20\%$  and  $W_k = \sum_{i \in k} w_i$

Diversification Target:  $\sum_{i=1}^n w_i^2 = 1/H$  where  $H = 50$

The quadratic Diversification constraint *regularises* the covariance matrix, therefore it imposes some regularity on the covariance matrix in order to remove noise. In particular, this constraint is equivalent to the traditional matrix shrinkage method which takes the covariance matrix towards the identity matrix.

Long Only Constraint:  $w_i \geq 0 \quad \forall_i$

Fully Invested:  $\sum_{i=1}^n w_i = 1$

**Liquidity Constraint:** The least liquid 5% of stocks as measured by the 50-day average daily traded value are removed from the selection universe in addition to the least liquid line(s) of corporate entities that consist of multiple lines.

**Maximum Weight Multiple:** The maximum weight multiple of the FTSE 100 market capitalisation weight in the FTSE 100 Minimum Variance Index is 30 times.

**Effective Zero Weight Threshold:** Any optimised stock weight that is less than one basis point is treated as having a zero weight in the Minimum Variance Index.





## Section 5

# Periodic Review of Constituent Companies

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### 5.0 Periodic Review of Constituent Companies

#### 5.1 Review Dates

5.1.1 The quarterly review will be implemented in line with the FTSE 100 Index and will be implemented after the close of trading on the third Friday of March, June, September and December.

#### 5.2 Review Procedure

5.2.1 The FTSE 100 Minimum Variance Index applies an optimisation algorithm to determine the weighting scheme applied to the constituents of the underlying FTSE 100. The algorithm will be applied at the security level. Closing price data on the Wednesday before the first Friday of March, June, September and December are used to determine the weighting scheme in the FTSE 100 Minimum Variance Index, based on the FTSE 100 constituents effective from the Monday following the third Friday of the same month.

5.2.2 The optimisation algorithm used to determine the FTSE 100 Minimum Variance Index weights will be applied at the security and not the company level. Where a corporate entity consists of multiple lines of stock, only the most liquid will be considered (as measured by the average 50 business day traded value) within the optimisation routine. The less liquid lines will be excluded from the optimisation and the resulting FTSE 100 Minimum Variance Index.

5.2.3 A relative liquidity screen will be applied to the FTSE 100 Index to determine the available universe for FTSE 100 Minimum Variance Index. As of the review date, the most liquid 95% of FTSE 100 constituents as measured by the average 50 business day trading value will be considered for inclusion in the FTSE 100 Minimum Variance Index. The liquidity rule will be applied in addition to and after the application of the treatment of Multiple Lines. For example, if two securities are excluded, the relative liquidity rule will exclude  $(100-2)*0.05=5$ , where the result is rounded up or down to the nearest integer number of stocks.



## Section 6

# Changes to Constituent Companies

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### **6.0 Changes to Constituent Companies**

#### **6.1 Intra-review Additions**

6.1.1 Additions into the FTSE 100 Minimum Variance Index will be considered for inclusion at the next quarterly review.

#### **6.2 Intra-review Deletions**

6.2.1 A constituent will be removed from the FTSE 100 Minimum Variance Index if it is also removed from the underlying FTSE 100 Index. The deletion will be concurrent with its deletion from the FTSE 100 Index and its weight will be distributed pro-rata amongst the remaining constituents in the FTSE 100 Minimum Variance Index.



## Section 7

# Corporate Actions and Events

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### 7.0 Corporate Actions and Events

- 7.1 If a constituent in a FTSE 100 Index has a stock split, stock consolidation, rights issue, bonus issue, a change in the number of shares in issue or a change in free-float, the constituent's weighting in the FTSE 100 Minimum Variance Index remains unchanged pre and post such an event.
- 7.2 Full details of changes to constituent companies due to corporate actions and events can be accessed in the Corporate Actions and Events Guide for Non Market Capitalisation Weighted Indexes using the following link:

[Corporate Actions and Events Guide for Non Market Cap Weighted Indices.pdf](#)

A Corporate 'Action' is an action on shareholders with a prescribed ex date. The share price will be subject to an adjustment on the ex date. These include the following:

- Capital Repayments
- Rights Issues/Entitlement Offers
- Stock Conversion
- Splits (sub-division) / Reverse splits (consolidation)
- Scrip issues (Capitalisation or Bonus Issue)

A Corporate 'Event' is a reaction to company news (event) that may impact the index depending on the index rules. For example, a company announces a strategic shareholder is offering to sell their shares (secondary share offer) – this could result in a free float weighting change in the index. Where an index adjustment is required FTSE Russell will provide notice advising of the timing of the change.

### 7.3 Takeovers, Mergers and Demergers

The treatment of takeovers, mergers and demergers can be found within the Corporate Actions and Events Guide for Non Market Capitalisation Weighted Indexes.

## Section 8

# Index Calculation

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### 8.0 Index calculation

#### 8.1 Prices

8.1.1 The FTSE 100 Minimum Variance Index will use actual trades on SETS.

#### 8.2 Calculation Frequency

8.2.1 The FTSE 100 Minimum Variance Index will be calculated in real-time using real time prices.

#### 8.3 Index Calculation

8.3.1 The FTSE 100 Minimum Variance Index will be displayed to two decimal points.

8.3.2 The FTSE 100 Minimum Variance Index is calculated using the following formula:

$$\sum_{i=1}^N \frac{(p_i \times e_i \times s_i \times f_i \times c_i)}{d}$$

Where,

- $i=1,2,\dots,N$
- $N$  is the number of securities in the index.
- $p_i$  is the latest trade price of the component security (or the price at the close of the index on the previous day).
- $e_i$  is the exchange rate required to convert the security's currency into the index's base currency.
- $s_i$  is the number of shares in issue used by FTSE Russell for the security, as defined in these Ground Rules.
- $f_i$  is the Investability Weighting Factor to be applied to a security to allow amendments to its weighting, expressed as a number between 0 and 1, where 1 represents a 100% free float. This factor is published by FTSE Russell for each security in the underlying index.
- $c_i$  is the Weighting Factor to be applied to a security to correctly weight that security in the index. This factor maps the investable market capitalisation of each stock to a notional market capitalisation for inclusion in the index.

- $d$  is the divisor, a figure that represents the total issued share capital of the index at the base date. The divisor can be adjusted to allow changes in the issued share capital of individual securities to be made without distorting the index.



## Appendix A: Index Opening and Closing Hours

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	Open	Close
FTSE 100 Minimum Variance Index	08:00	16:30

Notes:

1. Closing prices will be London Stock Exchange Official Closing Price.
2. The index will not be calculated on UK Public Holidays and may close early on the business day prior to the Christmas and New Year Public Holidays.
3. Timings are UK hours (GMT or BST).



## Appendix B: Status of Index

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The FTSE 100 Equally Weighted Index which is calculated in real time may exist in the following states. Official Market Hours are defined as that period when SETS is open for order execution.

### A) Firm

- i) The Index is being calculated during Official Market Hours on actual trades from SETS. No message will be displayed against the index value.
- ii) The Official Closing Price for FTSE 100 Equally Weighted Index will be the London Stock Exchange Official Closing Price.

### B) Closed

The Index has ceased all calculations for the day. The message 'CLOSE' will be displayed against the index value calculated by FTSE Russell.

### C) Held

During Official Market Hours, an index has exceeded pre-set operating parameters and the calculation has been suspended pending resolution of the problem. The message 'HELD' will be displayed against the last index value calculated by FTSE Russell.

### D) Indicative

If there is a system problem or situation in the market that is judged to affect the quality of the constituent prices at any time when an index is being calculated, the index will be declared indicative (e.g. normally where a 'fast market' exists in the equity market). The message 'IND' will be displayed against the index value calculated by FTSE Russell.

The official opening and closing hours of the FTSE 100 Equally Weighted Index are set out in Appendix A. Variations to the official hours of the Index will be published by FTSE Russell.



## Appendix C: Further Information

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A Glossary of Terms used in FTSE Russell's Ground Rule documents can be found using the following link:

[Glossary.pdf](#)

Further information on the FTSE 100 Equally Weighted Index is available from FTSE Russell.

For contact details please visit the FTSE Russell website or contact FTSE Russell client services at [info@ftserussell.com](mailto:info@ftserussell.com).

**Website:** [www.ftserussell.com](http://www.ftserussell.com)

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