Ground Rules

FTSE US Preferred Stock and Hybrids Index Series

v1.0

Contents

Section 1

Introduction

1.0 Introduction

1.1 **FTSE US Preferred Stock and Hybrids Index Series**

1.1.1 The FTSE US Preferred Stock and Hybrids Index Series is designed to provide a performance measure of preferred stock and other hybrid instruments issued in the US and denominated in USD.

Hybrid securities exhibit both bond and equity-like features. Preferred stock and other hybrids are distinguished such that:

- Preferred stock represent a class of ownership in a corporation that has a higher claim over assets and earnings than common stock, but is subordinate to bonds. Preferred stock dividends must generally be paid out before dividends to common stockholders, and can be deferred without triggering default of the company.
- Other hybrid securities are often loss absorbing, with coupons that can be deferred or suspended without triggering default. They may be perpetual, dated or have extendable maturity dates.

1.2 **Ground Rules**

1.2.1 This document sets out the Ground Rules for the construction and maintenance of the FTSE US Preferred Stock and Hybrids Index Series. Copies of these Ground Rules are available from FTSE Russell (see Appendix).

1.3 **Index Construction Methodology**

1.3.1 The FTSE US Preferred Stock and Hybrids Index series consists of dated and perpetual, USD-denominated securities in the US market that meet a minimum size requirement of USD 100 million amounts outstanding for par values of USD 25, 50, 100 and USD 250 million for securities with a par value of USD 1,000.

1.3.2 The following sub-indices will be calculated

A. Based on instrument type:

i. FTSE US Preferred Stock Index

ii. FTSE US Hybrid Security Index

B. Based on types of dividend

i. FTSE US Preferred Stock and Hybrids Fixed Rate Index

ii. FTSE US Preferred Stock and Hybrids Floating Rate Index

C. Based on ICB sectors

i. FTSE US Preferred Stock and Hybrids Financials Index

ii. FTSE US Preferred Stock and Hybrids Financials ex REITs Index

iii. FTSE US Preferred Stock and Hybrids Utilities Index

iv. FTSE US Preferred Stock and Hybrids Services Index

v. FTSE US Preferred Stock and Hybrids Agencies Index

vi. FTSE US Preferred Stock and Hybrids REITs Index

vii. FTSE US Preferred Stock and Hybrids Infrastructure Index

viii. FTSE US Preferred Stock and Hybrids Financial Index

ix. FTSE US Preferred Stock and Hybrids Ex-Financials Index

x. FTSE US Regulatory Capital Index

D. Based on credit rating

i. FTSE US Preferred Stock and Hybrids Investment-Grade Index

- AAA, AA, A, BBB

ii. FTSE US Preferred Stock and Hybrids High-Yield Index

- BB, B, CCC, CC, C

iii. FTSE US Preferred Stock and Hybrids Not Rated Index

iv. FTSE US Preferred Stock and Hybrids High-Yield and Not Rated Index

v. FTSE US Preferred Stock Investment-Grade and High-Yield Index

E. Based on issuer universe

i. FTSE US Russell 3000 Preferred Stock and Hybrids Index

ii. FTSE US Non-R3 Preferred Stock and Hybrids Index

F. Based on listing versus OTC

i. FTSE US Preferred Stock and Hybrids Exchange-listed Index

ii. FTSE US Preferred Stock and Hybrids OTC Index

G. Based on par value

i. FTSE US Preferred Stock and Hybrids Par 25, 50, 100 Index

ii. FTSE US Preferred Stock and Hybrids Par 1,000 Index

1.3.3 Price, total return and net of withholding tax return indices are calculated on an end-of-day basis. Dividends are included in the total return and net of withholding tax return indices based on their ex-dividend dates. The following analytics will also be calculated:

i. Annual dividend/coupon yield

ii. Yield to maturity

iii. Yield to call

iv. Yield to worst

v. Macaulay duration

vi. Modified Duration

vii. Duration to worst

viii. Convexity

ix. Average life

x. OAS

1.3.4 The indices hedged into AUD, CAD, CHF, CNY, EUR, GBP, HKD, JPY and SGD are also calculated.

1.3.5 The base currency of the index is US Dollars (USD).

1.4 The FTSE US Preferred Stock and Hybrids Index does not take account of ESG factors in its index design.

1.5 **IOSCO**

1.5.1 FTSE considers that the FTSE US Preferred Stock and Hybrids Index Series meets the IOSCO Principles for Financial Benchmarks as published in July 2013.

1.6 FTSE Russell hereby notifies users of the index series 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 series and therefore, any financial contracts or other financial instruments that reference the index series or investment funds which use the index series to measure their performance should be able to withstand, or otherwise address the possibility of changes to, or cessation of, the index series.

1.7 Index series users who choose to follow this index series or to buy products that claim to follow this index series should assess the merits of the index series' 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 (or any person concerned with the preparation or publication of these Ground Rules) 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 or any constituent data in the index series.

1.8 FTSE Russell

FTSE Russell is a trading name of FTSE International Limited, Frank Russell Company, FTSE Global Debt Capital Markets Limited (and its subsidiaries FTSE Global Debt Capital Markets Inc. and FTSE Fixed Income Europe Limited), FTSE Fixed Income LLC, The Yield Book Inc and Beyond Ratings.

Section 2

Management Responsibilities

2.0 Management Responsibilities

2.1 **FTSE International Limited (FTSE)**

2.1.1 FTSE is the benchmark administrator of the index series.[1]

2.1.2 FTSE is responsible for the daily calculation, production and operation of the index series and will:

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

2.2 **Status of these Ground Rules**

2.2.1 These Ground Rules set out the methodology and provide information about the publication of the FTSE US Preferred Stock and Hybrids Index Series.

2.3 **Amendments to These Ground Rules**

2.3.1 These Ground Rules shall be subject to regular review (at least once a year) by FTSE Russell to ensure that they continue to best reflect the aims of the index. 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 Index Governance Board before approval is granted.

[1] The term administrator is used in this document in the same sense as it is defined in Regulation (EU) 2016/1011 of the European Parliament and of the Council of 8 June 2016 on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds (the European Benchmark Regulation) and The Benchmarks (Amendment and Transitional Provision) (EU Exit) Regulations 2019 (the UK Benchmark Regulation).

Section 3

FTSE Russell Index Policies

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 **Queries and Complaints**

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

Benchmark_Determination_Complaints_Handling_Policy.pdf

3.2 **Statement of Principles for FTSE Russell Equity Indices (the Statement of Principles)**

Indices 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 Index Governance Board.

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

3.3 **Index Policy for Trading Halts and Market Closures**

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

Index_Policy_for_Trading_Halts_and_Market_Closures.pdf

3.4 **Index Policy in the Event Clients are Unable to Trade a Market or a Security**

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

Index_Policy_in_the_Event_Clients_are_Unable_to_Trade_a_Market_or_a_Security.pdf

3.5 **Recalculation Policy and Guidelines**

3.5.1 The FTSE US Preferred Stock Index Series is recalculated whenever errors or distortions occur that are deemed to be significant. Users of the Index Series are notified through appropriate media.

For further information refer to the FTSE Russell Recalculation Policy and Guidelines document which is available from FTSE Russell by contacting info@ftserussell.com.

3.6 Policy for Benchmark Methodology Changes

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

Policy_for_Benchmark_Methodology_Changes.pdf

3.7 FTSE Russell Governance Framework

3.7.1 To oversee its indices, FTSE Russell employs a governance framework that encompasses product, service and technology governance. The framework incorporates the London Stock Exchange Group's three lines of defence risk management framework and is designed to meet the requirements of the IOSCO Principles for Financial Benchmarks[2], the European benchmark regulation[3] and the UK benchmark regulation[4]. The FTSE Russell Governance Framework can be accessed using the following link:

FTSE_Russell_Governance_Framework.pdf

[2] IOSCO Principles for Financial Benchmarks Final Report, FR07/13 July 2013

[3] Regulation (EU) 2016/1011 of the European Parliament and of the Council of 8 June 2016 on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds

[4] The Benchmarks (Amendment and Transitional Provision) (EU Exit) Regulations 2019

Section 4

Corporate Actions and Events

4.0 Corporate Actions and Events

4.1 Full details of changes to constituent companies due to corporate actions and events can be accessed in the Corporate Actions and Events Guide using the following link:

Corporate_Actions_and_Events_Guide.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 will provide notice advising of the timing of the change.

Section 5

Qualification Criteria and Periodic Review of Constituents

5.0 Qualification Criteria and Periodic Review of Constituents

5.1 **Review Date**

5.1.1 The FTSE US Preferred Stock and Hybrids Index Series is reviewed on a monthly basis, and the profile is fixed 4 business days prior to month end. Index changes take effect at the open of the first business day of the following month.

5.1.2 On each index review date, index eligibility for the following month's index profile is determined. Between the review date and calendar month-end, market activities will continue to be tracked and issues that are called, tendered, or defaulted will be removed.

5.1.3 The index follows the US SIFMA Holiday Schedule where it relates to business days and fixing schedule. The index is calculated on every business day.

5.2 **Responsibilities and Reporting**

5.2.1 FTSE Russell will be responsible for conducting the monthly review of constituents of the FTSE US Preferred Stock and Hybrids Index Series.

5.3 **Review Process**

5.3.1 The monthly review is designed to provide stability in the constituents of the FTSE US Preferred Stock and Hybrids Index Series while ensuring that the index series continues to be representative of the market.

5.3.2 All securities that satisfy rules outlined in 4.4 are eligible constituents of the FTSE US Preferred Stock and Hybrids Index Series.

5.4 **FTSE US Preferred Stock and Hybrids Index Series Eligibility Criteria**

5.4.1 The following security types and features are eligible for the index

- Securities with par amounts of USD 25, USD 50, USD 100 and USD 1,000 are eligible
- Securities must meet the minimum par amount outstanding as of month-end rebalance as follows:
  - Minimum of USD 100 million amount outstanding for par amounts USD 25, USD 50, USD 100
  - Minimum of USD 250 million amount outstanding for par amounts USD 1,000

- Securities with a minimum maturity of at least one year as of the rebalance effective date, assuming T+0 settlement.
- Securities with fixed and floating dividends/coupons are eligible, including securities that switch from fixed to floating rate after a period of time. Dividends/coupons may be cumulative or non-cumulative.
- Hybrid securities must feature a deferrable dividend/coupon that does not trigger default of the issuer.
- Baby bonds[5] are eligible
- Securities may be perpetual or dated
- Securities with payment frequency of annual, semi-annual, quarterly and monthly.
- Generally, convertible securities are excluded. However, securities issued with conversion at regulator's discretion are eligible.

5.4.2 **Ineligible Securities**

The following security types and features are ineligible for the index:

- Pay-in-part, pay-in-kind, strippable, and inflation-linked securities
- Convertible securities
- Structured products
- Secured instruments, with the exception of baby bonds and preferred stocks
- Preferred stocks linked to a basket of securities or indices
- Sinking funds
- Securities where it is not possible to determine future cash flows. For example, where the coupon/dividends are at the issuer's discretion, or where it is not possible to determine the formula for the calculation of coupons/dividends in case of floating rate securities
- Securities with irregular payment schedules
- Securities with payment frequency of longer than 1 year
- Unregistered 144a Preferred Stocks
- Private placements
- Tier 2 instruments that conform to Basel III issued with par $1,000
- Security types which are not covered by the Yield Book analytics platform
- Securities not covered by Refinitiv
- Securities belonging to the following ICB classification[6] are not eligible for inclusion:

ICB Code	ICB Sector
302040	Closed End Investments

ICB Code	ICB Subsector
30205000	Open End and Miscellaneous Investment Vehicles
40201010	Education Services
40501030	Recreational Services

[5] Baby bonds are defined as $25 par subordinated debt (hybrids), that may or may not have a deferrable coupon feature.
[6] For more information on the FTSE ICB, please see the Industry Classification Benchmark (Equity) Ground Rules.

5.5 **Price Source**

5.5.1 Prices for both preferred stocks and hybrid securities are sourced from Refinitiv

5.5.2 Preferred stocks

- Where the primary listing is on a US exchange, the last trade price from the primary exchange will be used
- Where the primary listing is not on a US exchange or the security is traded over-the-counter, Refinitiv evaluated bid prices will be used, taking the 4pm snap

5.5.3 Hybrid securities

- Irrespective of listing status, Refinitiv evaluated bid prices will be used, taking the 4pm snap

5.6 **Price Quality**

5.6.1 Eligible constituents must have had at least one price update during the review month.

5.7 **Credit Quality**

5.7.1 Credit quality is assessed by ratings assigned by Moody's, S&P and Fitch. The most common rating is used. If all three are different, the middle rating is used. If only two are available, the lower rating is used. If only one rating is available, that rating is used. If no rating is available, an issuer rating may be used.

5.8 **Sector Classification**

5.8.1 The FTSE US Preferred Stock and Hybrids Index utilizes ICB, a proprietary industry and sector categorization schema. Securities without an ICB classification are not eligible for index inclusion.

5.9 **Multiple Lines**

5.9.1 Where a company issues multiple lines of preferred stock, all eligible lines are included in the FTSE US Preferred Stock and Hybrids Index Series and priced separately. However, a capping rule, as described in Rule 4.10, is applied.

5.10 **Capping Rules**

5.10.1 The constituents used to calculate capping factors will be indicative constituents at the monthly review, which incorporates additions/deletions and shares in issue/amounts outstanding updates. Prices from the close of business 4 business days prior to month end will be used. The capping factors will be effective at the open on the first business day of the following month.

5.10.2 The objective of capping the FTSE US Preferred Stock and Hybrids Index Series is to achieve no greater than 10% aggregate weights in each issuer.

5.11 **Capping Methodology**

5.11.1 Step 1: If the aggregate weight of an issuer is greater than 10%, its weight is capped at 10% and excess weight will be distributed pro-rata amongst the uncapped issuers.

5.11.2 Step 2: If the distribution of excess weight results in any issuer breaching the 10% cap, Step 1 will be repeated. This process will be repeated until all the issuer weights in the index are less than or equal to 10%

5.11.3 Step 3: If it is not possible to cap all the issuers at 10%, the capping limit will be raised by 0.5% and Steps 1 and 2 will be repeated. The capping limit will be incrementally raised by 0.5% until all the issuers are capped.

5.12 **Stale prices**

5.12.1 Where no price updates are received, the last good price will be rolled forward until the next review. If no price update is received before the next review, the constituent will be dropped when the rebalance is applied the following month.

5.13 **Settlement**

5.13.1 T+0 settlement assumption is used for the valuation and analytics.

5.14 **Sub-Indices**

5.14.1 If the index has no eligible constituents, the index value will be held at the last good value.

5.14.2 The index will come out of suspension when eligible constituent(s) are available.

5.15 **Base Date**

5.15.1 The base date for the index is 30th December, 2005.

Section 6

Changes to Constituent Companies

6.0 Changes to Constituent Companies

6.1 Corporate Actions

Corporate Actions	Adjustments	Adjustment Timing	
		Immediately	Next Review Date
Full Call	Where an issue is fully called between review dates, it is maintained in the index at the call price until the next review date.		✓
Partial Call	Where an issue is partially called between review dates, the called portion is retained in the index at the call price until the next monthly review, at which point it is removed. The remaining or un-called portion will be priced using the daily price and will remain in the index at a reduced weighting until the next monthly review. The un-called portion will remain a member of the index after the next review if it continues to remain eligible in all other respects.		✓
Partial Repurchase	Where a company buys back a portion of an issue between review dates, the re-purchased portion will remain in the index at market price until the next review date.		✓
Full Repurchase	If an issue is fully repurchased by the issuer, it will remain in the index at the transaction price until the next review date.		✓
Special Dividend	Special dividends may occur when a cumulative issue suspends its payments for a period of time and subsequently resumes the payment of dividends. In this case a special dividend, equal to the sum of the omitted dividend payments will be paid and held as cash in the index until next review.		✓

Suspended Dividend/ Deferred Coupon	Where a company announces that a coupon or dividend payment is deferred or suspended, or a company misses a coupon payment, the deferral treatment will be applied as described below. For non-cumulative securities, the security is carried forward until next rebalance, where it is then removed at market price. For cumulative securities, the omitted payments are accrued. Once paid as a special dividend/coupon, the dividend or coupon is held as cash in the index until next rebalance.		✓
Default	If an issue receives a default rating from any rating agency, the issue will be carried forward at last market closing price until next rebalance, where it is removed at market price.		✓
Listing	If a security, which is trading OTC and subsequently lists on a recognized US exchange, it will continue to be treated as an OTC security and evaluated prices will be used until next rebalance. At the next rebalance the security will move from the OTC sub-index to the Exchange Listed sub-index, subject to it meeting the eligibility criteria. From there on exchange traded prices will be used. This may not result in any turnover to the headline index.		✓
Delisting	If a security, which is listed on a recognized US exchange and subsequently delists, it will continue to be treated as an exchange listed security and in the absence of traded prices, last good exchange traded price will be used until next rebalance. At the next rebalance the security will move from the Exchange Listed sub-index to the OTC sub-index, subject to it meeting the eligibility criteria. From there on evaluated prices will be used. This may not result in any turnover to the headline index.		✓
Coupon Type Fixed to Float	Where a security switches from fixed rate coupon to floating rate, the analytics will be based on the floating rate. To avoid unnecessary turnover, the security will continue to be in the Fixed Rate sub-index and at next rebalance will move to the Floating Rate sub-index, subject to it meeting the eligibility criteria. This may not result in any turnover to the headline index.	✓	✓

6.2 **Intra-Review Additions**

6.2.1 There is no fast entry to the FTSE US Preferred Stock and Hybrids Index Series. New issuance and additions will be included in the index at the next review date if the issue is eligible in all respects.

6.3 **Intra-Review Deletions**

6.3.1 There will be no intra-review deletions.

6.4 **Mergers and Take-Overs Impact on Russell 3000 Sub-index Inclusion**

		Is Acquirer a member of Russell 3000 Index?	
		Yes	No
Is Preferred Stock Being Retired?	Yes	The preferred stock remains in the index at the transaction price until the next review	The preferred stock remains in the index at the transaction price until the next review.

	No	The preferred stock remains in the index at the daily traded price	The preferred stock remains in the index at the transaction price until the next review.

Section 7

Algorithm and Calculation Methodology

7.0 Calculation Methodology

7.1 Index

7.1.1 Total return index

The FTSE US Preferred Stock and Hybrids Index Series is calculated using the following formula:

$$TRI(t) = TRI(t-1) \times \frac{\sum_{i=1}^{n(r)}\left((p_i(t) \times s_i(t) \times af_i(r) + Cash_i(t))\right)}{\sum_{i=1}^{n(r)}\left((p_i(t-1) \times s_i(t-1) \times af_i(r) + Cash_i(t-1))\right)}$$

where,

- $TRI(t)$ is the total return index value on calculation day t
- $n(r)$ is the number of constituents in the Index, at rebalance day r.
- $p_i(t)$ is dirty price of the security $\begin{cases} if\ quoted\ clean\ then\ closing\ price + accrued\ interest \\ if\ quoted\ dirty\ then\ closing\ price \end{cases}$ of constituent i on calculation day t
- $s_i(t)$ is $\begin{cases} if\ quoted\ in\ percentage\ of\ par\ then\ \frac{amount\ Outstanding}{100} \\ if\ quoted\ in\ currency\ units\ then\ \frac{amount\ Outstanding}{par\ value} \end{cases}$ of constituent i on calculation day t
- $af_i(r)$ is the adjustment factor comprising of either capping factor or fundamental factor or all, of constituent i on rebalance day r. If not applicable, then the value is set to 1
- $Cash_i(t)$ is $\begin{cases} if\ debt\ security\ then\ coupon \\ if\ preferred\ stock\ then\ dividend \end{cases}$ of constituent i on calculation day t

7.1.2 Price index

$$PI(t) = PI(t-1) \times \frac{\sum_{i=1}^{n}\left(\left(p_i(t) \times s_i(t) \times af_i(r)\right)\right)}{\sum_{i=1}^{n}\left(\left(p_i(t-1) \times s_i(t) \times af_i(r)\right)\right)}$$

where,

- $PI(t)$ is the price index value on calculation day t
- $n(r)$ is the number of constituents in the Index, at rebalance day r.

- $p_i(t)$ is dirty price of the security $\begin{cases} if\ quoted\ clean\ then\ closing\ price + accrued\ interest \\ if\ quoted\ dirty\ then\ closing\ price \end{cases}$ of constituent i on calculation day t
- $s_i(t)$ is $\begin{cases} if\ quoted\ in\ percentage\ of\ par\ then\ \frac{amount\ Outstanding}{100} \\ if\ quoted\ in\ currency\ units\ then\ \frac{amount\ Outstanding}{par\ value} \end{cases}$ of constituent i on calculation day t
- $af_i(r)$ is the adjustment factor comprising of either capping factor or fundamental factor or all, of constituent i on rebalance day r. If not applicable, then the value is set to 1

7.1.3 Market Cap

$$MC(t) = \sum_{i=1}^{n} p_i(t) \times s_i(t) \times af_i(r)$$

where,

- $MC(t)$ is the market capitalisation on calculation day t
- $n(r)$ is the number of constituents in the Index, at rebalance day r.
- $p_i(t)$ is dirty price of the security $\begin{cases} if\ quoted\ clean\ then\ closing\ price + accrued\ interest \\ if\ quoted\ dirty\ then\ closing\ price \end{cases}$ of constituent i on calculation day t
- $s_i(t)$ is $\begin{cases} if\ quoted\ in\ percentage\ of\ par\ then\ \frac{amount\ Outstanding}{100} \\ if\ quoted\ in\ currency\ units\ then\ \frac{amount\ Outstanding}{par\ value} \end{cases}$ of constituent i on calculation day t
- $af_i(r)$ is the adjustment factor comprising of either capping factor or fundamental factor or all, of constituent i on rebalance day r. If not applicable, then the value is set to 1

7.1.4 Annual dividend/coupon yield

$$DY(t) = \frac{\sum_{i=1}^{n} dy_i(t) \times mc_i(t)}{MC(t)}$$

where,

- $DY(t)$ is the annual dividend/coupon yield on calculation day t
- $n(r)$ is the number of constituents in the Index, at rebalance day r.
- $dy_i(t)$ is the annual dividend/coupon yield of constituent i on calculation day t
- $mc_i(t)$ is the market capitalisation of constituent i on calculation day t
- $MC(t)$ is the market capitalisation on calculation day t

7.1.5 Yield to maturity

$$YTM(t) = \frac{\sum_{i=1}^{n} ytm_i(t) \times mc_i(t) \times moddur_i(t)}{\sum_{i}^{n} mc_i(t) \times moddur_i(t)}$$

where,

- $YTM(t)$ is the yield to maturity on calculation day t
- $n(r)$ is the number of constituents in the Index, at rebalance day r.
- $ytm_i(t)$ is the yield to maturity of constituent i on calculation day t
- $mc_i(t)$ is the market capitalisation of constituent i on calculation day t
- $moddur_i(t)$ is the modified duration to maturity of constituent i on calculation day t

7.1.6 Yield to call

$$YTC(t) = \frac{\sum_{i=1}^{n} ytc_i(t) \times mc_i(t) \times dtc_i(t)}{\sum_{i}^{n} mc_i(t) \times dtc_i(t)}$$

where,

- $YTC(t)$ is the yield to call on calculation day t
- $n(r)$ is the number of constituents in the Index, at rebalance day r.
- $ytc_i(t)$ is the yield to call of constituent i on calculation day t
- $mc_i(t)$ is the market capitalisation of constituent i on calculation day t
- $dtc_i(t)$ is the modified duration to call of constituent i on calculation day t

7.1.7 Yield to worst

$$YTW(t) = \frac{\sum_{i=1}^{n} ytw_i(t) \times mc_i(t) \times dtw_i(t)}{\sum_{i}^{n} mc_i(t) \times dtw_i(t)}$$

where,

- $YTW(t)$ is the yield to worst on calculation day t
- $n(r)$ is the number of constituents in the Index, at rebalance day r.
- $ytm_i(t)$ is the yield to maturity of constituent i on calculation day t
- $mc_i(t)$ is the market capitalisation of constituent i on calculation day t
- $dtw_i(t)$ is the modified duration to worst of constituent i on calculation day t

7.1.8 Macaulay duration

$$MacDur(t) = \frac{\sum_{i=1}^{n} macdur_i(t) \times mc_i(t)}{MC(t)}$$

where,

- $MacDur(t)$ is the Macaulay duration on calculation day t
- $n(r)$ is the number of constituents in the Index, at rebalance day r.
- $macdur_i(t)$ is the Macaulay duration of constituent i on calculation day t
- $mc_i(t)$ is the market capitalisation of constituent i on calculation day t

  $MC(t)$ is the market capitalisation on calculation day t

7.1.9 Modified duration

$$ModDur(t) = \frac{\sum_{i=1}^{n} moddur(m)_i(t) \times mc_i(t)}{MC(t)}$$

where,

- $ModDur(t)$ is the modified duration on calculation day t
- $n(r)$ is the number of constituents in the Index, at rebalance day r.
- $moddur(m)_i(t)$ is the modified duration to maturity of constituent i on calculation day t
- $mc_i(t)$ is the market capitalisation of constituent i on calculation day t
- $MC(t)$ is the market capitalisation on calculation day t

7.1.10 Duration to worst

$$DTW(t) = \frac{\sum_{i=1}^{n} dtw_i(t) \times mc_i(t)}{MC(t)}$$

where,

- $DTW(t)$ is the modified duration on calculation day t
- $n(r)$ is the number of constituents in the Index, at rebalance day r.
- $dtw_i(t)$ is the modified duration to worst of constituent i on calculation day t
- $mc_i(t)$ is the market capitalisation of constituent i on calculation day t
- $MC(t)$ is the market capitalisation on calculation day t

7.1.11 Convexity

$$Cnvxt(t) = \frac{\sum_{i=1}^{n} cnvxt_i(t) \times mc_i(t)}{MC(t)}$$

where,

- $Cnvxt(t)$ is the convexity on calculation day t
- $n(r)$ is the number of constituents in the Index, at rebalance day r.
- $cnvxt_i(t)$ is the convexity of constituent i on calculation day t
- $mc_i(t)$ is the market capitalisation of constituent i on calculation day t
- $MC(t)$ is the market capitalisation on calculation day t

7.1.12 Average life

$$AvgLife(t) = \frac{\sum_{i=1}^{n} avglife_i(t) \times mc_i(t)}{MC(t)}$$

where,

- $AvgLife(t)$ is the average life/term to maturity on calculation day t
- $avglife_i(t)$ is the average life/term to maturity of constituent i on calculation day t
- $mc_i(t)$ is the market capitalisation of constituent i on calculation day t
- $MC(t)$ is the market capitalisation on calculation day t

7.1.13 Option adjusted spread – OAS

$$OAS(t) = \frac{\sum_{i=1}^{n} oas_i(t) \times mc_i(t)}{MC(t)}$$

where,

- $OAS(t)$ is the option adjusted spread on calculation day t
- $n(r)$ is the number of constituents in the Index, at rebalance day r.
- $oas_i(t)$ is the option adjusted spread of constituent i on calculation day t
- $mc_i(t)$ is the market capitalisation of constituent i on calculation day t
- $MC(t)$ is the market capitalisation on calculation day t

7.1.14 Effective Duration

$$EffDur(t) = \frac{\sum_{i=1}^{n} effdur_i(t) \times mc_i(t)}{MC(t)}$$

where,

- $EffDur(t)$ is the Effective Duration on calculation day t
- $effdur_i(t)$ is the effective duration of constituent i on calculation day t
- $mc_i(t)$ is the market capitalisation of constituent i on calculation day t
- $MC(t)$ is the market capitalisation on calculation day t

7.2 Issue level

7.2.1 Market Cap

$$mc_i(t) = p_i(t) \times s_i(t) \times af_i(r)$$

where,

- $mc_i(t)$ is the market capitalisation of constituent i on calculation day t.
- $p_i(t)$ is dirty price of the security $\begin{cases} if\ quoted\ clean\ then\ closing\ price + accrued\ interest \\ if\ quoted\ dirty\ then\ closing\ price \end{cases}$ of constituent i on calculation day t
- $s_i(t)$ is $\begin{cases} if\ quoted\ in\ percentage\ of\ par\ then\ \frac{amount\ Outstanding}{100} \\ if\ quoted\ in\ currency\ units\ then\ \frac{amount\ Outstanding}{par\ value} \end{cases}$ of constituent i on calculation day t
- $af_i(r)$ is the adjustment factor comprising of either capping factor or fundamental factor or all, of constituent i on rebalance day r. If not applicable, then the value is set to 1

7.2.2 Annual dividend/coupon/current yield

The annual dividend/coupon yield of the index is calculated by dividing the annual income by the market capitalisation of the index. The annual income of a constituent is derived from its dividend/coupon rate and is set to zero if the payments are suspended.

$$dy_i(t) = \frac{c_i(t0) \times b_i(t)}{p_i(t)}$$

where,

- $dy_i(t)$ is the annual dividend/coupon yield in percentage terms for constituent i on calculation day t
- $c_i(t)$ is the annual dividend/coupon rate in percentage terms for constituent i on previous payment day $t0$
- $p_i(t)$ is dirty price of the security $\begin{cases} if\ quoted\ clean\ then\ closing\ price + accrued\ interest \\ if\ quoted\ dirty\ then\ closing\ price \end{cases}$ of constituent i on calculation day t.

7.2.3 Yield to maturity

$$p_i(t) = \sum_{k=\frac{v}{d}}^{m+\frac{v}{d}} \frac{cf_i(t1)}{\left(1 + \frac{ytm_i(t)}{f_i}\right)^k}$$

where,

- $p_i(t)$ is dirty price of the security $\begin{cases} if\ quoted\ clean\ then\ closing\ price + accrued\ interest \\ if\ quoted\ dirty\ then\ closing\ price \end{cases}$ of constituent i on calculation day t
- $cf_i(t1)$ is the cash flow due from constituent i at the next payment day $t1$.
- $ytm_i(t)$ is the yield to maturity of constituent i on calculation day t.
- f_i is the number of cash flows per year of constituent i.
- m is denote the number of payment periods until maturity. For perpetual securities the maturity date is set to rolling 100 years from the next cash flow date.
- v is the number of calendar days to next cash flow according the day count convention of constituent i.
- d is the number of calendar days between the previous cash flow and the next cash flow according the day count convention of constituent i.
- k is the time in cash flow periods.

7.2.4 Yield to call

Same as Yield to maturity except the cash flows are up to the next call date rather than the maturity date.

7.2.5 Yield to worst

$$ytw_i(t) = min\big(ytm_i(t), ytc_i(t)\big)$$

where,

- $ytw_i(t)$ is the yield to worst for constituent i on calculation day t
- $ytm_i(t)$ is the yield to maturity for constituent i on calculation day t
- $ytc_i(t)$ is the yield to call for constituent i on calculation day t

7.2.6 Macaulay duration

$$macdur_i(t) = \frac{\sum_{k=\frac{v}{d}}^{m+\frac{v}{d}} \frac{cf_i(t1) \times k}{\left(1 + \frac{ytm_i(t)}{f_i}\right)^k}}{p_i(t) \times f_i}$$

where,

- $macdur_i(t)$ is the Macaulay duration of constituent i on calculation day t.
- $p_i(t)$ is dirty price of the security $\begin{cases} if\ quoted\ clean\ then\ closing\ price + accrued\ interest \\ if\ quoted\ dirty\ then\ closing\ price \end{cases}$ of constituent i on calculation day t
- $cf_i(t1)$ is the cash flow due from constituent i at the next payment day $t1$.
- $ytm_i(t)$ is the yield to maturity of constituent i on calculation day t.
- f_i is the number of cash flows per year of constituent i.
- m is denote the number of payment periods until maturity. For perpetual securities the maturity date is set to rolling 100 years from the next cash flow date.
- v is the number of calendar days to next cash flow according the day count convention of constituent i.

- d is the number of calendar days between the previous cash flow and the next cash flow according the day count convention of constituent i.
- k is the time in cash flow periods.

7.2.7 Modified duration

$$moddur_i(t) = \frac{macdur_i(t)}{(1 + ytm_i(t))}$$

where,

- $moddur_i(t)$ is the modified duration to maturity for constituent i on calculation day t
- $macdur_i(t)$ is the Macaulay duration for constituent i on calculation day t
- $ytm_i(t)$ is the yield to maturity for constituent i on calculation day t

7.2.8 Duration to call

Same as Modified duration to maturity except the cash flows are up to the next call date rather than the maturity date

7.2.9 Duration to worst

$$dtw_i(t) = \frac{mdw_i(t)}{(1 + ytw_i(t))}$$

where,

- $dtw_i(t)$ is the modified duration to worst for constituent i on calculation day t
- $mdw_i(t)$ is the Macaulay duration to worst for constituent i on calculation day t
- $ytw_i(t)$ is the yield to worst for constituent i on calculation day t

7.2.10 Convexity

$$cnvxt_i(t) = \frac{\sum_{k=\frac{v}{d}}^{m+\frac{v}{d}} \left(cf_i(t1) \times \left(\frac{k}{f_i} + \frac{k^2}{f_i^2} \right) \frac{1}{(1 + ytm_i)^k} \right)}{p_i(t) \times (1 + ytm_i)^2}$$

where,

- $cnvxt_i(t)$ is the convexity of constituent i on calculation day t.
- $p_i(t)$ is dirty price of the security $\begin{cases} if\ quoted\ clean\ then\ closing\ price + accrued\ interest \\ if\ quoted\ dirty\ then\ closing\ price \end{cases}$ of constituent i on calculation day t
- $cf_i(t1)$ is the cash flow due from constituent i at the next payment day $t1$.
- $ytm_i(t)$ is the yield to maturity of constituent i on calculation day t.
- f_i is the number of cash flows per year of constituent i.
- m is denote the number of payment periods until maturity. For perpetual securities the maturity date is set to rolling 100 years from the next cash flow date.
- v is the number of calendar days to next cash flow according the day count convention of constituent i.

- d is the number of calendar days between the previous cash flow and the next cash flow according the day count convention of constituent i.
- k is the time in cash flow periods.

7.2.11 Effective duration

$$effdur_i(t) = \frac{\left(p_{i,-1}(t) - p_{i,+1}(t)\right)}{\left(2 \times p_i(t) * 0.001\right)}$$

where,

- $EffDur_i(t)$ is the Effective duration of constituent i on calculation day (t).
- $p_i(t)$ is original dirty price of the security $\begin{cases} if\ quoted\ clean\ then\ closing\ price + accrued\ interest \\ if\ quoted\ dirty\ then\ closing\ price \end{cases}$ of constituent i on calculation day t
- $p_{i,-1}(t)$ is dirty price of the constituent i at (t) if the yield were to decrease by 1 basis point
- $p_{i,+1}(t)$ is dirty price of the constituent i at (t) if the yield were to increase by 1 basis point

Section 8

Announcing Changes

8.0 Announcing changes

8.1 **Changes to Constituents**

8.1.1 Index changes arising from the monthly review will be published four business days prior to the month end.

Appendix A: Further Information

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 US Preferred Stock Index Series is available from FTSE Russell.

For contact details please visit the FTSE Russell website or contact FTSE Russell Client Services at info@ftserussell.com.

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