cfbenchmarks
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CF Meta Lab GameFi Index

Modified Market Cap Weight Variants

Methodology Guide

Version:

1.3

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Contents

1 Version History

Version	Date Issued	Summary of Change	Owner
V1.0	01 Oct 2023	n/a	CF Benchmarks Product Management
V1.1	13 Nov 2023	Update to logo & format	CF Benchmarks Marketing
V1.2	20 Nov 2023	Updated logo (AKC v2)	CF Benchmarks Marketing
V1.3	22 Apr 2024	Update Entry Float Factor criteria	CF Benchmarks Management
V2.3	23 July 2024	Remove section "Constituent Observation Windows and Partition Lengths"	CF Benchmarks Management

2 Introduction

2.1 Index Aims

The CF Meta Lab GameFi Index (the "***Index***") seeks to track the performance of the GameFi ecosystem through a portfolio of Digital Assets that are native to such protocols, information networks and blockchain networks that constitute the infrastructure necessary to deliver this ecosystem's products and services to end-users. To achieve this aim, it is necessary to construct a portfolio that will always comprise Digital Assets associated with all the segments of the value-chain that enable the effective functioning of the GameFi ecosystem and delivery of its products and services.

2.2 Requirements

For the Index to meet its stated aims it must be:

- **Representative**

To achieve true representation of the GameFi ecosystem it is necessary to construct a portfolio that ensures exposure to all Digital Assets associated with the functionality required to deliver the ecosystem's products and services to end-users. Whilst most observers would associate the GameFi ecosystem with this Sector's specific Decentralized Applications (dApps), it is important to remember that GameFi Applications cannot deliver their services to end-users in isolation but are reliant on a variety of blockchain and service networks to do so. Given this, the index should include Digital Assets native to these blockchain and services as constituents in sub-portfolios to ensure that the index has consistent exposure to the different Categories within the value chain.

- **Replicable**

Each index constituent is selected in accordance with a transparent set of rule-based inclusion criteria covering asset safekeeping, liquidity, asset turnover as well as rule-based buffering for exclusion of existing constituents at reconstitution. Index constituent pricing sources also utilise fully replicable rules-based methodologies. The Administrator does not utilise expert judgement in the day-to-day calculation.

- **Reliable**

    - The index aims would be best fulfilled by dividing the index into sub portfolios to gain exposure to the full value chain of the GameFi ecosystem. The weighting of such sub-portfolios is in the proportion to which they enable the GameFi Applications to deliver services and products to end users. However, given the nascent nature of the ecosystem and its rapid evolution, a more simplified weighting structure will be employed until such time that the proportionate contribution of the different sub-portfolios can be more reliably determined.

2.3 Underlying Economic Reality

The Index is intended to measure the underlying economic reality of the value of the GameFi assets in units of the quote asset as held in a portfolio that seeks to replicate the market beta of the GameFi ecosystem. This is achieved by observing the exchange of the base assets for the quote asset and vice versa. This is accomplished using transactional input data from Constituent Exchanges, that are selected based on published Constituent Exchange Criteria. The Administrator shall undertake the selection process based on Meta Data pertaining to the GameFi sector.

3 Index Parameters

3.1 Portfolio Composition

The Index Portfolio shall be constituted of three sub-portfolios to ensure constant exposure to all the elements of the value chain that are necessary to deliver GameFi products & services.

- **Sector Applications** - The sub-portfolio of Digital Assets shall include the primary tokens associated to the operation or governance of protocols that underpin decentralized applications that are delivering services associated with the GameFi sector.

- **On-chain Services** - The sub-portfolio shall include Digital Assets that are native to systems that enable the GameFi Applications within the portfolio to interact with and deliver settlement between end-users on a blockchain network. These services include what are commonly referred to as; "Layer 2" blockchains, "Oracle" networks and "scaling solutions" or protocols that enable the value-chain for such decentralized applications by way of scaling, or other services.

- **Settlement Networks** - The sub-portfolio shall include the Digital Assets that are native to the blockchains where transactions generated by the GameFi Applications within the portfolio are settled between counterparties.

3.2 Eligible Index Constituents

The Index constituents shall be assets which are eligible under **CF Digital Asset Multi - Asset Series Ground Rules – Section 2 – Investable Universe.** There shall be a maximum number of total constituents to balance the fulfilment of the Index aims without undue burden on investors.

To be eligible for inclusion in the index, Constituents shall have a Full Market Capitalization that is above the **Minimum Full Market Cap** for the Index as defined in the Index Parameters. Full Market Capitalization shall be calculated in accordance with Section 4.2 of **CF Digital Asset Multi - Asset Series Ground Rules.**

Digital Assets that are, by their design, pegged to the value of other assets such as, but not limited to, fiat currency ("stablecoins"), a physical commodity or another Digital Asset, are not eligible for inclusion. Digital assets whose status is ambiguous or has been questioned by Regulatory and Supervisory Authorities of major jurisdictions including, but not limited to, the United States of America, the European Union and the United Kingdom are also not eligible for inclusion.

The eligible constituents for a GameFi Index shall include:

1. The digital assets associated with software protocols that are classified as part of the **Gaming, VR & AR, NFT Platforms** and **Social** segments in accordance with the **CF Digital Asset Classification Structure ("DACS"),** and they shall form the constituents of the **Sector Applications** sub-portfolio.

2. The digital assets associated with the software protocols that provide on-chain services that are utilised by the software protocols associated with the digital assets that comprise the **Sector Applications** sub-portfolio shall form the constituents of the **On-chain Services** sub-portfolio.
3. The digital assets that are native to the software protocol that is used to settle the transfer of assets, whether directly or indirectly, that are the result of transactions facilitated by the sector applications that comprise the **Sector Applications** sub-portfolio shall form the constituents of the **Settlement Networks** sub-portfolio. In addition to this, only digital assets of Settlement Networks that pass the minimum daily average of transferred assets as a percentage of the Network with the highest volume (minimum settlement volume), will be considered eligible. The average shall be computed using the 6 most recent months of transfer data. Should such data be partially unavailable, the Administrator shall use a shorter sample of data but equally representative of the Network's activity. Should transfer data be fully unavailable, the Administrator shall use the Sector constituent's total supply of digital assets on a given network instead and follow the same procedure as above i.e. compute its total supply ratio as a percentage of the total supply of the constituent's main Settlement Network.

To be able to reliably determine the pricing of any constituent of the Index any Digital Asset that is not listed on 2 (two) or more constituent exchanges shall not be eligible for Inclusion.

3.3 Index Denomination

The Index is denominated in a unique fiat as outlined in the **Index Parameter Tables.**

3.4 Index Return Types

The index is available in two return variants:

- **Total Return:** Inclusive of distributions (such as forks, airdrops amongst others) and deductions - the definition and treatment of distributions and deductions are defined in the ***CF Digital Asset Index Family - Multi Asset Series Ground Rules – Section 7 - Treatment of Distributions & Section 8 - Treatment of Deductions.***
- **Price Return:** Exclusive of distributions but inclusive of deductions.

3.5 Calculation & Publication Frequency

The Index shall be calculated once a day at a time as defined in the **Index Parameter Tables** and published soon after, 365 days a year.

3.6 Constituent Reviews

Constituent Reviews are carried in accordance with the ***CF Benchmarks Multi Digital Asset Indices Ground Rules - Section 3 - Constituent Review*** and employ the below constituent review buffers.

Sector Applications:

- Where a Digital Asset that is not an existing constituent of the **Sector Application** sub-portfolio reaches a market capitalisation rank of ***12 or higher*** it will replace an existing constituent that is the lowest ranked by market capitalisation.
- Where a Digital Asset that is not an existing index Sector constituent reaches a market capitalisation rank of ***16*** then it will only enter the index and replace an existing index constituent if an existing index constituent falls to a market capitalisation rank of **28** or lower.
- Where a Digital Asset that is not an existing index Sector constituent reaches a market capitalisation rank of ***20*** then it will only enter the index and replace an existing index constituent if the existing index constituent falls to a market capitalisation rank of ***32*** or lower.

Where the number of the **Sector Applications** sub-portfolio's constituents are less than the maximum outlined below, the Administrator will modify the buffer parameters proportionately.

On-chain Services:

- Where a Digital Asset that is not an existing constituent of the **On-chain Services** sub-portfolio reaches a market capitalisation rank of ***6 or higher*** it will replace an existing constituent that is the lowest ranked by market capitalisation.
- Where a Digital Asset that is not an existing index Sector constituent reaches a market capitalisation rank of ***8*** then it will only enter the index and replace an existing index constituent if an existing index constituent falls to a market capitalisation rank of **14** or lower.
- Where a Digital Asset that is not an existing index Sector constituent reaches a market capitalisation rank of ***10*** then it will only enter the index and replace an existing index constituent if the existing index constituent falls to a market capitalisation rank of ***16*** or lower.

Where the number of the **On-chain Services** sub-portfolio's constituents are less than the maximum outlined below the Administrator will modify the buffer parameters proportionately.

Settlement Networks:

- Where a Digital Asset that is not an existing constituent of the **Settlement Networks** sub-portfolio reaches a market capitalisation rank of ***3 or higher*** it will replace an existing constituent that is the lowest ranked by market capitalisation.
- Where a Digital Asset that is not an existing index Sector constituent reaches a market capitalisation rank of ***4*** then it will only enter the index and replace an existing index constituent if an existing index constituent falls to a market capitalisation rank of **7** or lower.

- Where a Digital Asset that is not an existing index Sector constituent reaches a market capitalisation rank of ***5*** then it will only enter the index and replace an existing index constituent if the existing index constituent falls to a market capitalisation rank of ***8*** or lower.

Where the number of the **Settlement Networks** sub-portfolio's constituents are less than the maximum outlined below, the Administrator will modify the buffer parameters proportionately.

3.7 Constituent Weighting

3.7.1 Weighting within each Sub-Portfolio

The Index is composed of three sub-portfolios with weights as per the **Index Parameter Tables.**
The Index constituents within each sub-portfolio are weighted as follows:

- **Sector Applications:** Allocated per the weighting method in the **Index Parameter Table** across GameFi protocols with a maximum of 20 assets to ensure adequate index exposure to a wide range of sector activities without hindering replication through the inclusion of small capitalization assets. Sector assets will be ranked by Full Market Capitalization to determine the top indices to be considered for inclusion in the Sector sub-portfolio. As the crypto ecosystem matures and more metadata that may be used to inform constituent weights becomes available in the future, the Administrator may consider additional metrics in selecting assets to ensure the Index adequately represents the GameFi activities.
- **On-chain Services:** Allocated across a maximum of 10 protocols in proportion to their usage and relevance to the selected Sector assets. However, until the ecosystem matures and liquidity improves, such weightings shall be allocated per the weighting method in the **Index Parameter Table**.
- **Settlement Networks:** Allocated across a maximum of 5 Settlement protocols in proportion to their usage and relevance to the Sector assets. However, until the ecosystem matures and liquidity improves, such weightings shall be allocated per the weighting method in the Index Parameter Table.

3.7.2 Entry Float Factor ("EFF")

To facilitate replicability and mitigate against liquidity risks caused by significant weight changes at each Reconstitution, the following shall apply only to any **incoming Constituents** entering the Index at any Reconstitution and only to Indices that **do not have a weighting cap** in place.

- Where an incoming Constituent would enter the index at a weight of 15% or higher, an EFF shall be applied.

- The EFF for an incoming Constituent shall be applied as a discount factor to the Free-Float Supply of the incoming Constituent at Reconstitution at each 15% weight increment above 15%.

Weight Increment	Discount
0-15%	0%
15-30%	70%
30-45%	90%
45-60%	97%
60-75%	100%
75-90%	100%
90-100%	100%

- The EFF shall be applied only at entry for the incoming Constituent. Subsequent rebalances shall be in accordance with the existing supply calculation and application rules set out in the ***CF Digital Asset Index Family - Multi Asset Series Ground Rules.***

3.8 Index Constituent Pricing Sources (Input Data)

3.8.1 Spot Rate

The Index Constituent Pricing Source shall be the CF Benchmarks Spot Rates available at https://www.cfbenchmarks.com/ or other CF Benchmarks pricing sources that utilise the same calculation methodology as CF Benchmarks single Asset Real Time and Spot Prices - see **Parameter Tables** for **Constituent Observation Windows and Partition Lengths**.

3.8.2 Settlement Price

The Index Constituent Pricing Source shall be the CF Benchmarks Reference Rates available on https://www.cfbenchmarks.com/ or other CF Benchmarks pricing sources that utilise the same calculation methodology as CF Benchmarks single Asset Reference and Settlement Prices - see **Parameter Tables** for **Observation Windows and Partition Lengths**.

The respective methodologies for each of these pricing benchmarks is available at https://www.cfbenchmarks.com/documentation/products/classification.

Should these sources become permanently unavailable then ***CF Digital Asset Index Family - Multi Asset Series Ground Rules - Section 6 - Input Data Hierarchy*** shall be applied.

3.9 Rebalance Frequency

The Index shall be rebalanced per the frequency defined in the Index Parameters per the procedures described in the ***CF Benchmarks Multi Asset Index Ground Rules – Section 6 - Rebalance Procedure.***

3.9.1 Rebalance Determination Point

16:00:00 UTC on the day which is 8 business days prior to the Rebalance Implementation Point.

3.9.2 Rebalance Implementation Point

At the Index Calculation & Publication time on the first business day of the Rebalance month.

3.9.3 Rebalance Determination Pricing Source

The Index Rebalance Determination Pricing Source shall be the CF Benchmarks Reference Rates available on https://www.cfbenchmarks.com/ or other CF Benchmarks pricing sources that utilise the same calculation methodology as CF Benchmarks single Asset Reference and Settlement Prices - see Parameter table for observation windows and partition lengths.
The respective methodologies for each of these pricing benchmarks is available at https://www.cfbenchmarks.com/documentation/products/classification.
Should these sources become permanently unavailable then ***CF Digital Asset Index Family - Multi Asset Series Ground Rules - Section 6 - Input Data Hierarchy*** shall be applied.

4 Index Parameter Tables

4.1 CF Meta Lab GameFi Index

Index Name	**CF Meta Lab GameFi Index – Modified Market Cap Weight - LDN**
Ticker (Price Return)	CMGFMWLDN_RR_PR
Ticker (Total Return)	CMGFMWLDN_RR_TR
Inception Date	01 September 2022
Inception Value	1,000
Base Currency	USD
Constituents	Finance-Sector Applications: maximum of 20 constituents On-chain Services: maximum of 10 constituents Settlement Networks: maximum of 5 constituents
Constituent Pricing Sources	CF Benchmarks Pricing Sources
Constituent Selection Method	Sector Applications: Full Market Capitalization rank of GameFi applications that fall within the Gaming, VR & AR, NFT Platforms and Social segments of the CF Digital Asset Classification Structure. On-Chain Services: protocols utilized by the Sector Applications constituents Settlement Networks: protocols utilized by the Sector Applications constituents
Return Types	• Total Return • Price Return
Calculation & Publication Time	Calculation & Publication at 16:00 and 16:10 London time respectively
Calculation & Publication Frequency	Every day, 365 days a year.
Constituent Minimum Full Market Capitalization Ratio	0.10%
Constituent Minimum Liquidity Requirement	0.05%
Minimum Settlement Volume	25%
Buffers for Exclusion of an Existing Constituent at Reconstitution	- 50% of the Minimum Full Market Cap - 50% of the Minimum Liquidity Ratio - 50% of the Minimum Settlement Volume
Constituent Weighting	70% Sector Applications – Market Cap Weight between assets. 15% On-Chain Services – Market Cap Weight between assets. 15% Settlement Networks– Market Cap Weight between assets.
Weighting Caps	20%
Weighting Floors	None

Rebalance Frequency / Month	Quarterly – 1st business day of March, June, Sep, Dec.
Rebalance Determination Time	16:00:00 UTC on the day which is 8 business days prior to the Rebalance Implementation Point
Rebalance Implementation Time	On the Calculation & Publication time, on the first business day of Rebalance month.

4.2 Expert Judgement

The Administrator does not utilise expert judgement in the day-to-day calculation of the index. In extraordinary circumstances Expert Judgement may be exercised by the Administrator in the calculation, constituent review and rebalance procedure for the index. This will be done in accordance with its codified policies and processes which are available upon request.

5 Index Calculation Method

Usage of Parameter between Variants

Parameters are different between variants of this index family. Each section shall apply to each variant independently, except for those equations which have parameters marked with the variant label:

Type	Label
Spot Rate	RTI
Settlement Price	RR
Total Return	TR
Price Return	PR

5.1 Index methodology

The CF Meta Lab GameFi Index is a basket of baskets. The index is fixed weighted, i.e. the weight each constituent basket represent are fixed. Those fixed weights are set in the Index Parameter Table. The weighting methodology within each constituent basket can be either fix weighted or free float market capitalisation weighted. The methodology is specified in the Index Parameter Table as well as the weights if the methodology is fixed weighted.

The Index value follows the methodology:

$$\forall k_i \leq t < k_{i+1},\ I_t^{SCI} = \frac{1}{d_{k_i}^{SCI}}\left(I_t^{Sector} * g_{k_i}^{Sector} + I_t^{Service} * g_{k_i}^{Service} + I_t^{Settlement} * g_{k_i}^{Settlement}\right)$$

$Where\ I_t^{Sector}$, $I_t^{Service}$ and $I_t^{Settlement}$ are independently calculated using Section 5.2.

$Where\ g_t^{Sector}$, $g_t^{Service}$ and $g_t^{Settlement}$ are calculated as per below:

The relative supply of the index constituents within the Digital Asset Sector are derived from the input weights:

$$At\ t = k_1, \begin{cases} g_{k_1}^{Sector} = \dfrac{w_{k_1}^{Sector} * I_{k_1}^{SCI,RR}}{I_{k_1}^{Sector,RR}} \\ g_{k_1}^{Service} = \dfrac{w_{k_1}^{Service} * I_{k_1}^{SCI,RR}}{I_{k_1}^{Service,RR}} \\ g_{k_1}^{Settlement} = \dfrac{w_{k_1}^{Settlement} * I_{k_1}^{SCI,RR}}{I_{k_1}^{Settlement,RR}} \end{cases}$$

$$At\ i \geq 2, \begin{cases} g_{k_i}^{Sector} = \dfrac{w_i^{Sector} * S_i}{\varrho_{k_i}^{Sector,RR}} \\ g_{k_i}^{Service} = \dfrac{w_{k_i}^{Service} * S_i}{\varrho_{k_i}^{Service,RR}} \\ g_{k_i}^{Settlement} = \dfrac{w_{k_i}^{Settlement} * S_i}{\varrho_{k_i}^{Settlement,RR}} \end{cases}$$

$$with\ S_i = g_{k_{i-1}}^{Sector} * \varrho_{k_i}^{Sector,RR} + g_{k_{i-1}}^{Service} * \varrho_{k_i}^{Service,RR} + g_{k_{i-1}}^{Settlement} * \varrho_{k_i}^{Settlement,RR}$$

$Where\ d_{k_i}^{SCI}$:

$$\begin{cases} d_{k_1}^{SCI} = \dfrac{1}{I_{k_1}^{SCI}} \left(g_{k_1}^{Sector} * p_{k_1}^{Sector,RR} + g_{k_1}^{Service} * p_{k_1}^{Service,RR} + g_{k_1}^{Settlement} * p_{k_1}^{Settlement,RR} \right) \\ \forall i \geq 2,\ d_{k_i}^{SCI} = d_{k_{i-1}}^{SCI} . \dfrac{g_{k_i}^{Sector} * \varrho_{k_i}^{Sector,RR} + g_{k_i}^{Service} * \varrho_{k_i}^{Service,RR} + g_{k_i}^{Settlement} * \varrho_{k_i}^{Settlement,RR}}{g_{k_{i-1}}^{Sector} * \varrho_{k_i}^{Sector,RR} + g_{k_{i-1}}^{S\square\square rvice} * \varrho_{k_i}^{Service,RR} + g_{k_{i-1}}^{Settlement} * \varrho_{k_{i-1}}^{Settlement,RR}} \end{cases}$$

5.2 Methodologies

5.2.1 Definitions

Symbol	Name	Description
t	Effective time	The time at which the index is calculated
r_i	Rebalance Determination Time	The time when the rebalance parameters are determined for the i^{th} rebalance
k_i	Rebalance Implementation Time	The time when the rebalance parameters are implemented for the i^{th} rebalance
$c \in C_i$	Index Constituents	The list of constituents that are determined to be index constituents for the ith rebalance
p_t^c	Constituent Pricing Source	The price of constituent c at time t
ϱ_t^c	Determination Price	The price of constituent c used at time t used for rebalance, distribution and deduction. Note that this may be different from the Constituent Pricing Source
$w_{k_i}^c$	Weight	The weight of constituent c used for the ith rebalance
$g_{k_i}^c$	Relative supply	The relative supply of constituent c used for the ith rebalance
d_{k_i}	Divisor	Divisor used for the i^{th} rebalance.
R_t	Return factor	Return factor at time t
A_{r_i}	Return amount	Return amount used for the i^{th} rebalance

I_t	Index value	Index value at time t

5.2.2 List of Methodologies

The index value is some factors times the sum for all constituents of the products of the constituent's weight and price:

$$I_i^B = R_{k_i}/d_i \sum_{c \in C_1} price(c,i) * supply(c,i)$$

Where B is a basket index.
Where R_{k_i} is to account for distributions and deductions.
Where d_i is the divisor needed for the index value to be continuous. More precision on the formula in Section 5.3.5.
The constituents' prices are given by the rebalance pricing source described in Section 3.8.
The Index weighting methodology must be one of the following:

1. Fixed weights for all constituents.
2. Free Float Market Capitalisation for all constituents.

5.2.3 Weights Calculation

The relative supply $g_{k_i}^c$ and the weight $w_{r_i}^c$ relation is the following:

$$\begin{cases} g_{k_1}^c p_{k_1}^{c,RR} = w_{k_1}^c I_{k_1}^{RR} \\ \forall i \geq 2,\ g_{k_i}^c \varrho_{k_i}^{c,RR} = w_{k_i}^c \sum_{c' \in C_i} g_{k_{i-1}}^{c'} \varrho_{k_i}^{c',RR} \end{cases} (1)$$

The Index initial value is $I_{k_1}^{RR} = 1000$ if not specified otherwise in the **Index Parameter Table.**

Case 1: Fixed Weights
The fixed weights are given as inputs. They must respect the capping and flooring and the sum of all weights must be 100%. The relative supply is inferred using the equation (1) above.

Case 2: Free Float Market Capitalisation
The Free Float Market Capitalisation is based on the **Total Supply Likely to be Available for Trading** as detailed in ***CF Benchmarks Multi Asset Index Ground Rules – Section 4 Constituent Weighting.***

Note: In both *Case 1* and *Case 2*, the Rebalancing Implementation Time price ϱ_i^c is required to obtain both the supply $g_{k_i}^c$ *and the weight* $w_{k_i}^c$. Hence both are indicated to be also at Rebalancing Implementation Time, even if one of the two might be known and/or computed at the Rebalancing Determination Time.

Example:
Let's consider a fixed weight index composed of two asset A and B with the following parameters:

$$\begin{cases} W^A = 50\% \\ W^B = 50\% \end{cases}, \begin{cases} p_{k_1}^{A,RR} = 50 \\ p_{k_1}^{B,RR} = 25 \end{cases} \text{ and } I_{k_1}^{RR} = 1000.$$

At $T{=}k_1$:

$$using\ (eq\ 1): \begin{cases} g_{t_1}^A = \dfrac{W^A * I_{k_1}^{RR}}{p_{k_1}^{A,RR}} = \dfrac{0.5 * 1000}{50} = 10\ (unit\ A) \\ g_{t_1}^A = \dfrac{W^A * I_{k_1}^{RR}}{p_{k_1}^{B,RR}} = \dfrac{0.5 * 1000}{25} = 20\ (unit\ B) \end{cases}$$

At $T{=}k_2$:
The suppose the rebalancing price is now:

$$\begin{cases} \varrho_{k_2}^{A,RR} = 50 \\ \varrho_{k_2}^{B,RR} = 40 \end{cases}$$

The index value before rebalancing is the following:

$$\sum_{c \in C_1} g_{k_1}^c \varrho_{k_2}^{c,RR} = 10 * 50 + 20 * 40 = 1300$$

Hence the new relative supply is:

$$using\ (eq\ 1): \begin{cases} g_{k_2}^A = \dfrac{W^A * \sum_{c \in C_1} g_{k_1}^c \varrho_{k_2}^{c,RR}}{\varrho_{k_2}^{A,RR}} = \dfrac{0.5 * 1300}{50} = 13 \\ g_{k_2}^B = \dfrac{W^B * \sum_{c \in C_1} g_{k_1}^c \varrho_{k_2}^{c,RR}}{\varrho_{k_2}^{B,RR}} = \dfrac{0.5 * 1300}{40} = 16.25 \end{cases}$$

5.2.4 Capping and Flooring

All methodology can apply a cap and floor on the constituents' weights. The case where no cap and floor are used is equivalent to a floor of 0% and a cap of 100%. Therefore, the following methodology is unique whether a cap and/or floor is applied.
The Capping value C and Flooring value F is given in the **Index Parameter Table**. The minimum capping and maximum flooring are: 1/ number of constituents.
Any constituent whose weight is greater than C is capped at C. Similarly, any constituent whose weight is smaller than F is floored at F. The **Aggregated Weight** to distribute is the difference between the weights lost due to capping and the weights added due to flooring.
Where the **Aggregated Weight** is positive, it shall be distributed proportionately on the constituents that are not capped. Where the **Aggregated Weight** is negative, it shall be subtracted proportionately from the constituents that are not floored.
This process is repeated until all constituents' weights are above or equal to F and below or equal to C.

5.2.5 Index Calculation

The index value at time t where $k_i \leq t < k_{i+1}$ is given by

$$I_t = \frac{R_t}{d_{k_i}} \sum_{c \in C_i} g_{k_i}^c p_t^c$$

About R_t:
At index inception there are no distributions or deductions hence $R_0 = 1$.
If the application point of distribution and deduction events is at time t, where $k_i \leq t < k_{i+1}$, let the Return Amount A_t be the sum of all Distribution Proceeds and Deductions Amounts from said events. Then the distribution adjustment factor shall be

$$R_t = R_{t-1}\left(1 + \frac{A_t}{\sum_{c \in C_i} g_t^c \varrho_t^c}\right)$$

Otherwise $R_t = R_{t-1}$.

About d_{k_i}:
The divisor is used to scale the index so that the value of the index is fixed at inception and continuous at each rebalancing. The divisor factor shall be:

$$\begin{cases} d_{k_1} = \frac{1}{I_{k_1}^{RR}} \sum_{c \in C_1} g_{k_1}^c \, p_{k_1}^{c,RR} \\ \forall i \geq 2, \; d_{k_i} = d_{k_{i-1}} \cdot \frac{\sum_{c \in C_i} g_{k_i}^c \varrho_{k_i}^{c,RR}}{\sum_{c \in C_{i-1}} g_{k_{i-1}}^c \varrho_{k_i}^{c,RR}} \end{cases}$$

5.2.6 Metadata

The *index share* of a constituent is defined as the number of units of a constituent one needs to buy such that the composition of all constituents reproduces the value of the index.

Example:
The index value is 1000. Assume a return factor of 1.6.

$$share_i^c = \frac{R_{k_i}}{d_{k_i}} g_{k_i}^{c,RR}$$

Constituent	Price	Weight	Relative supply	Index share
A	$5	50%	62.5	100
B	$2	50%	156.25	250

6 Contingency Calculation Rules

There may be instances where the Index cannot be calculated according to the calculation methodology.

6.1 Delayed Calculation and Dissemination

Where any Constituent Pricing Source for the calculation of the index is delayed, missing or otherwise not available for any index calculation time the index value shall be deemed delayed, where no index value will be published. The index shall resume publication when valid Constituent Pricing Source(s) are published.

Where any Determination Price for the calculation of the index is delayed, missing or otherwise not available for a Rebalance, Distribution or Deduction Implementation Point, the index value(s) on and subsequent from Rebalance Implementation Point shall be deemed delayed, where no index value(s) will be published. The index shall resume publication when valid Determination Price(s) are published.

Where for the above or any reason the Administrator is not able to calculate and publish the index within the Dissemination Time on any given Calculation Day then the Administrator shall publish a notification on its website at https://www.cfbenchmarks.com/blog/category/index-announcements informing index users that calculation and publication has been delayed. The Administrator will seek to publish the Index for that Calculation Day as soon as it is able to.

6.2 Calculation Failure

If the index cannot be calculated for a given Calculation Day before 23:59:59 London time, for instance because:

- A Constituent Pricing Source for the calculation time is not published, or published but not retrieved by the Calculation Agent before 23:59:59 London time
- A Determination Price for the Rebalance, Distribution or Deduction Implementation Point is not published, or published but not retrieved by the Calculation Agent before 23:59:59 London time
- Any other reason or circumstance that prevents the orderly calculation of the index

Then the index value for that calculation day is given by the index value on the previous Calculation Day and this index value shall be published with a marker of (*).

The occurrence of any index calculation failure is announced at https://www.cfbenchmarks.com/blog/category/index-announcements

7 Restatement & Republishing

The Administrator implemented CF Benchmarks Multi Asset Index Restatement Policy ("the Policy") which outlines circumstances; materiality thresholds and timing for the Administrator's restatement and republishing process.

Where circumstances require to restate the stated index settlement price it will be restated and republished before 23:59:59 London time of that Calculation Day. For clarity where an error was identified on Day 1 but the process of investigating and agreeing corrective measures was concluded on Day 3 then it will be the Day 3 index settlement price that will be restated and republished before 23:59:59 London time of that Calculation Day.

The Policy is subject to an internal review by the Administrator at least annually. It will also be reviewed in line with business changes and changes to regulation.

The latest Policy document is available here.

8 Methodology Review and Changes to the Index

This methodology is subject to internal review by the Administrator at least annually.

All material changes to the methodology shall only be implemented after a consultation process with users and relevant stakeholders that shall be conducted according to the Administrator's policies.

Should the Administrator deem it necessary to cease providing the Index it shall only do so after a consultation process with users and relevant stakeholders that shall be conducted according to the Administrator's policies.

Contact Information

CF Benchmarks Ltd

Address	Contact
CF Benchmarks Ltd 6th Floor One London Wall London EC2Y 5EB	Web: https://www.cfbenchmarks.com Phone: +44 20 8164 9900 Email: contact@cfbenchmarks.com
	Formal complaints or concerns must be submitted by Email: complaints@cfbenchmarks.com Further details can be found on https://blog.cfbenchmarks.com/about/

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