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LOMBARD ODIER

INVESTMENT MANAGERS

Index Methodology Fixed Income Fundamentally Weighted Indices

Smart Beta · Fixed Income

December 2018

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Part I: Index Overview

1. Index Specifications

1.1. Index Family

The following Lombard Odier Investment Managers (LOIM) fundamental fixed income indices are covered in this methodology:

Table 1 – Indices Covered

Ticker BBG code	Index name	Index type	Base currency	Market type	Rebalance frequency	Inception date	Base value
LOFEURG Index	LOIM Fundamental Euro Government	Government	EUR	Developed	Monthly	12-Apr-11	100
LOFUOEC Index	LOIM Fundamental Global Government	Government	USD	Developed	Monthly	16-Dec-10	100
LOFEMLU Index	LOIM Fundamental EM Local Currency	Government	USD	Emerging	Monthly	12-Jan-10	100
LOFEUCP Index	LOIM Fundamental Euro Corporate	Corporate	EUR	Developed	Semi Annual	14-Apr-15	100
LOFGLUIG Index	LOIM Fundamental Global Corporate	Corporate	USD	Developed	Semi Annual	20-Dec-12	100
LOFE5B Index	LOIM Fundamental Euro BBB-BB	Corporate	EUR	Developed	Semi Annual	01-Dec-10	100
LOFGLU5B Index	LOIM Fundamental Global BBB-BB	Corporate	USD	Developed	Semi Annual	16-Jul-12	100

1.2. Distribution

The Index is published by Bloomberg Indexes and is distributed to Lombard Odier. Each vendor determines whether they will distribute/display the index data via their respective information systems.

1.3. Calculation Frequency

The Indices are calculated and published once on each weekday, i.e., Monday to Friday inclusive, irrespective of holidays on the local markets.

1.4. Index Accuracy

The Index shall be published to an accuracy of 3 decimal places. Any incorrect calculation of the Index shall be adjusted on a retrospective basis and announced on **https://www.loim.com/home/investment-approach/smart-beta/index-details.html**

1.5. Decision-making Bodies

1.5.1. Index Oversight Committee

A committee composed of representatives from LOIM (the "**Index Oversight Committee**") is responsible for the design and creation of this Index Methodology and any periodic amendments thereto. Members of the Index Oversight Committee may at any time recommend changes to this Index Methodology (including the Index selection criteria and list of Eligible Countries) by submitting any proposed changes to the Index Oversight Committee for consideration and approval in advance of the next Scheduled Determination Date.

Following approval by the Index Oversight Committee, such changes shall be implemented by way of an update to this Index Methodology which shall be published on **https://www.loim.com/home/investment-approach/smart-beta/index-details.html**

The Index Oversight Committee typically meets on a semi-annual basis in advance of each semi-annual Scheduled Determination Date with respect to the Credit Indices, and on a monthly basis in advance of each monthly Scheduled Determination Date for the Government Indices. The Index Oversight Committee members are provided in Table 2, below:

Table 2 – Index Oversight Committee: Members

Name	Function within LOIM	Contact Details
Jan Straatman	Consultant (former Global CIO)	Email: j.straatman@lombardodier.com
Carolina Minio-Paluello	Global Head of Sales & Solutions	Email: c.minio-paluello@lombardodier.com
Stephen Grobman	Chief Risk Officer	Email: Stephen.Grobman@lombardodier.com
Fidelis Wangata	Head of Compliance	Email: f.wangata@lombardodier.com
Alexandre Meyer	Chief Operations Officer	Email: a.meyer@lombardodier.com
Puja Schams	Business Manager	Email: p.schams@lombardodier.com

1.5.2. Supervisory Index Committee

Where an extraordinary event occurs or is occurring, e.g., a market disruption event such as but not limited to: a force majeure, act of god, economic crisis, or any other event which the Calculation Agent deems as resulting in inadequate or null price information an "affected security," then a committee composed of staff from The Calculation Agent (the "**Supervisory Index Committee**") shall be responsible for determining the price of that affected security, which may involve using the most recent traded price, BVAL price, or any source that the Supervisory Index Committee deems applicable, including the possibility of removing such affected security from the Index return calculations.

Table 3 – Supervisory Index Committee: Members

Name	Contact Details
William Mast	Tel: +1-212-617-3104 Email: wmast2@bloomberg.net
Scott Stallwood	Tel: 908-788-8664 Email: sstallwood@bloomberg.net
Michael Luongo	Tel: 212-617-7710 Email: mluongo@bloomberg.net
Andrew Neilan	Tel: 44-20-3525-3167 Email: aneilan@bloomberg.net

1.6. Index Licensing

Stock exchanges, banks, financial services providers and investment houses seeking to reference the Index value directly or indirectly for derivative instruments, custom indices/benchmarks or any other index type or product will require a valid license by LOIM.

Part II: Eligible Government Universe

Inclusions – for each Eligible Universe

- **Classification:** Classified as having been issued by a "Government" as defined by Bloomberg Industry Classification (BICS) 1
- **Currency:** Issued in the same currency as that of the local currency of that government's country.
- **Coupon:** Fixed-rate
- **Bond Maturity:** ≥ 1 year as of each monthly Index Determination Date

Global Government Eligible Universe

- Each country must be a member of the Organization for Economic Co-operation and Development (OECD)
- Exclusion: Inflation-linked bonds

Euro Government Eligible Universe

- Each country must be a member of the European Monetary Union (EMU)
- Bond must be EUR-denominated
- Exclusion: Inflation-linked bonds

Emerging Market Local Eligible Universe

- Each country must be defined as "**Emerging market and developing economies**" by the International Monetary Fund (IMF) as published in the World Economic Outlook (WEO)
- **Exclusion**: Inflation linked bonds, with the exception of inflation-linked bonds issued by Chile (in CLF)

Exclusions – for each Eligible Universe

- **Table 1:** Factor Weights displays the macro-economic data, which forms the Factor Weights for the Index. The data is published in April and October. Countries/issuers which have no data pertaining to the current rebalance are removed from the respective Eligible Universe.
- **UCITS Requirement:** The market in which the securities trade are required to be **regulated, operate regularly, be recognized and open to the public**. Please see **APPENDIX UCITS Guidance Note 1/96** for full definitions

Table 1 – Factor Weights

Credit Factors		Social/Demographic Factors		Macro Factors	
Public Debt to GDP Ratio (–)	15%	Political Stability (+)	10%	PPPGDP (+)	30%
Net International Investment Position (+)	15%	Old Age Dependency Ratio (+)	5%		
Fiscal Balance (+)	10%	Misery Index (+)	5%		
Private Debt to GDP Ratio (+)	5%				
Current Account Balance (+)	5%				

Source: IMF, World Bank, United Nations. See Appendix for full definitions and data access.

Part III: Eligible Corporate Universe

In order to determine the Eligible Credit Universe, which will form the basis for the LOIM Fundamental Euro Corporate Index and LOIM Fundamental Global Corporate Index, we work our way through Table 1, following in numerical order from Step 1 to Step 7. The residual bonds which remain after the final step, Step 7: Exclusions, will form the Eligible Credit Universe.

Table 1 – Determing the Eligible Credit Universe

Step	Filter	Description
1	Currency	• For the LOIM Fundamental Euro Corporate Index and LOIM Fundamental Euro BBB-BB Index: Consider only EUR-denominated bonds • For the LOIM Fundamental Global Corporate Index and LOIM Fundamental Global BBB-BB Index: Consider only EUR-, USD-, GBP- denominated bonds
2	Amount outstanding	• For the LOIM Fundamental Euro Corporate Index: ≥ EUR 500mn • For the LOIM Fundamental Global Corporate Index ≥ EUR 500mn, ≥ USD 500mn, ≥ GBP 350mn
		See Table 2: Amount Outstanding for BBB-BB Indices
3	Sector	• Only consider issuers who are members of a LOIM sector
4	Bond Maturity	• Only consider bonds with a maturity ≥ 1.5 years as of the Determination Date
5	Bond Rating	**For LOIM Fundamental Euro Corporate Index and LOIM Fundamental Global Corporate Index** • Only consider investment grade bonds: Moody's Baa3, S&P BBB-, Fitch BBB-; or higher **For LOIM Fundamental Euro BBB-BB Index and LOIM Fundamental Global BBB-BB Index** • Only consider bonds with rating between: Moody's Baa1 and Ba3, S&P BBB+ and BB-, Fitch BBB+ and BB- In both cases: I. When all three are available, choose the middle rating II. When two agency ratings are available, choose the lowest rating III. When only one agency rating is available, choose that credit rating
6	Coupon Type	• Fixed-rate coupon
7	Exclusion	• Securitized and covered bonds • Warrants, convertibles, and other equity conversion type bonds • Inflation-linked bonds, floating-rate issues • Private placements, retail bonds • Structured Notes, pass-through certificates

- **UCITS Requirement**: The market in which the securities trade are required to be regulated, operate regularly, be recognized and open to the public. Please see **APPENDIX UCITS Guidance Note 1/96** for full definitions

Table 2 – Amount Oustanding for BBB-BB Indices

Rating Agency	Bond Rating	Amount Outstanding
Moody's	Baa1 to Baa3	• ≥ EUR 500 million • ≥ USD 500 million • ≥ GBP 350 million
	Ba1 to Ba3	• ≥ EUR 250 million • ≥ USD 250 million • ≥ GBP 200 million
S&P	BBB+ to BBB-	• ≥ EUR 500 million • ≥ USD 500 million • ≥ GBP 350 million
	BB+ to BB-	• ≥ EUR 250 million • ≥ USD 250 million • ≥ GBP 200 million
Fitch	BBB+ to BBB-	• ≥ EUR 500 million • ≥ USD 500 million • ≥ GBP 350 million
	BB+ to BB-	• ≥ EUR 250 million • ≥ USD 250 million • ≥ GBP 200 million

PART IV: Building the Fundamental Fixed Income Corporate Indices

1. Notation and Definitions

Definition 1

Let I be the set of all issuers in the Eligible Corporate Universe, and $I_i \in I$ the i^{th} issuer in that set. Typically called the i^{th} element belonging to set I, and $|I|$ the number of elements in set I.

Definition 2

Let $\mathcal{G}$ be the set of eligible regions where bonds can be issued, namely United States, UK and Euro region. And $G_k \in \mathcal{G}$ the k^{th} geographical region belonging to the set $\mathcal{G}$, where $k = 1, 2, 3$, with $|\mathcal{G}| = 3$

Note

An issuer can appear in one or more regions if the issuer has issued bonds denominated in that country/region's currency. For example, suppose corporate ABC, a bank, has issued bonds denominated in USD, EUR. Then its sector classification would be **Banking** Sector and it would appear twice: Once in the **Banking** Sector sector within the US region, and once in the **Banking** Sector of the Euro region.

Notation

When defining sets and subsets and explaining the mathematics which ensue, it is often useful to hold a region constant, denoted by $\hat{\mathcal{G}}$ (pronounced "G – hat"). One would then repeat the steps involved in the formula containing the "hat" expression, but replacing the constant with another element of that set.

Definition 3

Let $\mathcal{S}$ be the set of sectors within a fixed geographical region $\widehat{\mathcal{G}}$, and $S_k \in \mathcal{S}$ the k^{th} sector belonging to $\mathcal{S}$ within that fixed region $\widehat{\mathcal{G}}$. The strict notation which will be used throughout the calculations will be of the fashion $S_k \in \mathcal{S} \subset \hat{\mathcal{G}}$. Where $\mathcal{S} \subset \hat{\mathcal{G}}$ denotes the relationship "subset of," i.e., $\mathcal{S}$ is a subset of $\hat{\mathcal{G}}$.

Definition 4

Let B^{Ii} be the set of all bonds issued by issuer I_i, and $bond_k^{I_i}$ denote the individual bonds, with $k = 1, 2, \cdots, |B^{Ii}|$.

Definition 5

Let $\Omega^{I_i, S_k, \hat{\mathcal{G}}}$ be the set of all bonds, $bond_j^{I_i}\ over\ j$ issued by issuer I_i within sector S_k, within a fixed geographical region $\hat{\mathcal{G}}$. Then we have:

$$\Omega^{I_i, S_k, \hat{\mathcal{G}}} = \left\{ bond_j^{I_i \in S_k \subset \hat{\mathcal{G}}} \;\middle|\; k = 1, 2, \cdots, 9 \right\}$$

Definition 6

Let $H^{S_k, \hat{\mathcal{G}}}$ be the set of all Issuers within a fixed sector S_k, within a fixed region $\hat{\mathcal{G}}$, i.e., $H^{S_k, \hat{\mathcal{G}}} = \{I_i \mid I_i \in S_k \subset \mid k = 1, 2, \cdots, 9\}$

2. LOIM Sector Description

The following LOIM Sectors and their descriptions are used throughout the Index calculations:

Table 1 – LOIM Sectors

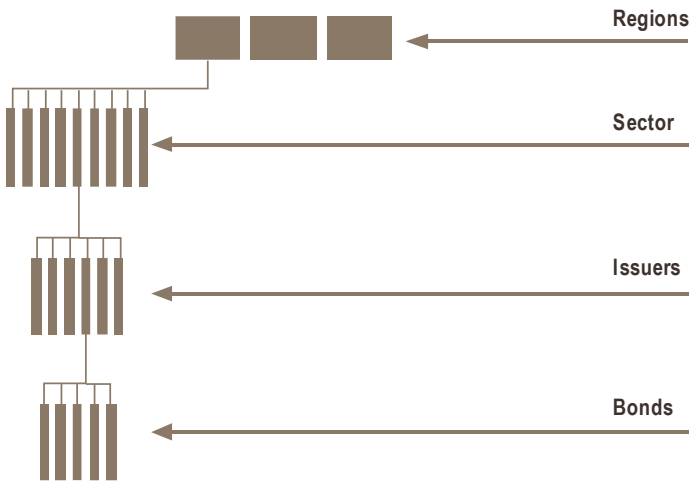
Sector	Description
Basic Industry	Extraction, distribution & manufacture of natural resources and related services. Encompasses the extraction, refining, basic processing & distribution of oil, metal, wood & paper & packing resources.
Capital Goods	Manufacture & distribution of machinery & products that are sold business to business & in turn used in the production of finished goods. These include building materials, engineering & construction machinery as well as holding companies that invest in diversified range of business.
Chemicals – Healthcare	Manufacture & distribution of chemicals, medicines, pharmaceuticals, surgical and healthcare products. All aspects of healthcare services including hospital, clinical & home care.

Retail – Service	Manufacture and distribution of consumer goods & provision of services for consumption, leisure and retail. Services cover those for consumers and businesses such as property, food services, facilities management, and employment. Excludes vehicle manufacture, communication and health-related products & services captured by other sectors.
Autos-Aerospace	Manufacture of vehicles, & their component parts used to transport goods and people including automobiles, ships, trucks & aeroplanes. Includes the captive finance companies
Utilities	Utilities including the generation and distribution of electricity, heating, water and provision of waste, environmental services and REITS.
TMT – Transport	Communications infrastructure and services encompassing telephone, media, technology and transport used to broadcast and communicate virtually or physically. Transport infrastructure services include airlines, shipping, railway networks and toll roads but exclude manufacture of the vehicles that use them such as automobiles and aeroplanes.
Bank	Financial institutions that provide services to commercial and retail customers such as accepting deposits and giving loans
Non-bank Financial	Firms that provide financial services to commercial and retail customers including brokers, insurance (life and non-life) and general financial services such as consumer finance, specialty finance, asset management and investment services.

See Appendix: Bloomberg Sector Mapping to LOIM Sectors.

The below figure, Figure 1, displays the hierarchical relationship between bond, issuer, sector and region, and defined by **Definition 6**.

Fig. 1 – All bonds within a sector with a region



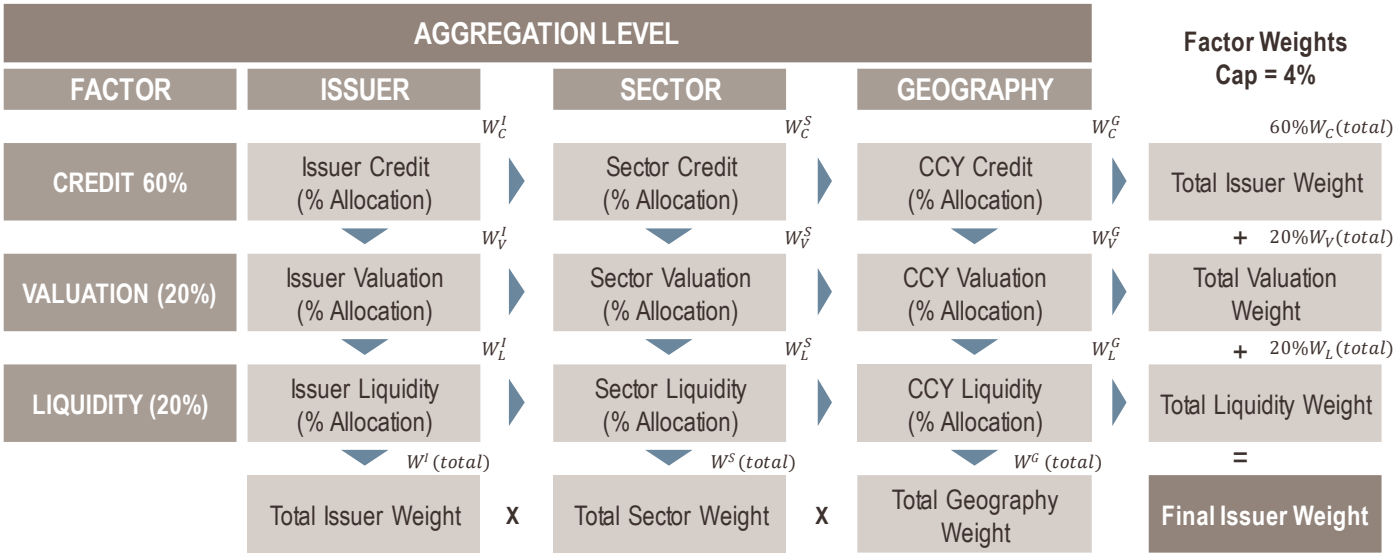
3. Weight Determination Scheme

Overview In order determine the Final Issuer Weights we refer to **Figure 1**: **Road Mapping Process**, which outlines nine separate "% **Allocations**." Each % Allocation is attributable to a Factor (Credit, Valuation, and Liquidity) and to an Aggregation Level (Issuer, Sector, and Geography). Both the Factor and Aggregation Level are dimensions which, when combined together, form the basis of the road mapping process.

Aggregation Level Dimension: This dimension is divided into three levels: i) Issuer Level, ii) Sector Level and iii) Geographical Level. The process for calculating Aggregation Level (or column) **flows** down the rows (or Factors) as depicted in the Figure 1. This leads to a Total Issuer Weight, Total Sector Weight, and Total Geographical Weight. The product of these total weights yields the Final Issuer Weight, with some additional Factor Weight Caps which will be described later on.

- **Issuer Level:** Determines the % Allocation attributable to the bond's issuer, in a particular sector for a particular region, in the benchmark
- **Sector Level:** Determines the % Allocation attributable to the bond's currency, for a particular sector, in the benchmark
- **Geographical Level:** Determines the % Allocation attributable to the bond's currency, for a particular region, in the benchmark

Fig. 2 – Road mapping process



Factor Level Dimension: This dimension is divided into three levels (or factors): i) Credit Factor, ii) Valuation Factor, and iii) Liquidity Factor. The process for calculating the Factor Level (or row) flows along the columns (or Aggregation Levels) as depicted in Figure 1. This leads to a Total Credit Weight, Total Valuation Weight, and Total Liquidity Weight. These are required as the weight per issuer that is attributable to each Total Factor Weight, e.g., Total Credit Weight, is capped at 4%. As mentioned above the Factor Weight Capping will be explained later on.

- **Credit Factor**: Macro and Micro economic based allocation. Allocation done to capture the potential risk of issuer (idiosyncratic risk) and sector (Bubble effect)
- **Valuation Factor**: Market based allocation. Allocation based on bonds pricing to capture the realized risk already priced by the market
- **Liquidity Factor**: Liquidity based allocation. Make sure that the computed index is liquidity-adjusted

3.1. Issuer Level

3.1.1 Credit Factors

- The determination of the issuer level credit % Allocation reflects the credit-worthiness of the individual issuers. The metrics and their weightings depend on the following sector breakdown:

Table 2 – Factors applied to banking issuers

Credit measure item	Detail	Weight effect	Description
Size			
Size (25%)	Revenues	+	High revenues give a higher allocation as they reflect scale & better resilience to shocks
Indebtedness			
Leverage (15%)	Total assets/Total common equity	–	Higher assets relative to equity means higher reliance on debt financing and is lower weighted
Funding			
Funding Profile (15%)	Gross loans/deposits	–	High loans relative to deposits means higher reliance on borrowed funds and is lower weighted
Asset quality			
Asset quality 1 (20%)	Loan loss provisions/ pre-provisions profit	–	High impairment charges relative to pre-provision profit are lower weighted
Asset quality 2 (25%)	Loan loss provisions/gross loans	–	High impairment charges relative to loan balances are lower weighted

Source: S&P Capital IQ.

Table 3 – Factors applied to financial ex-banking issuers

Credit measure item	Detail	Weight effect	Description
Size			
Size (30%)	Revenues	+	High revenues give a higher allocation as they reflect scale & better resilience to shocks
Indebtedness			
Leverage (25%)	Total assets/Total common equity	–	Higher assets relative to equity means higher reliance on debt financing and is lower weighted
Earnings generation			
Return on equity (15%)	Earnings from continuing operations/Average equity	+	Higher returns on equity and capital generation capacity are higher weighted
Return on revenues (30%)	Earnings from continuing operations/Total revenues	+	Higher returns on revenue and better cost control are higher weighted

Source: S&P Capital IQ.

Table 4 – Factors applied to corporate ex-financial issuers

Credit measure item	Detail	Weight effect	Description
Size			
Size (30%)	Revenues	+	Higher revenues give a higher allocation as they reflect scale & better resilience to shocks.
Indebtedness			
Leverage (30%)	Adjusted total debt/EBITDAR	–	Higher debt levels relative to the earnings generated to repay the debt are lower weighted.
Interest Cover (15%)	EBITDAR/interest paid	+	Higher levels of earnings relative to the debt expense that needs to be paid out of earnings are higher weighted.
Cash generation			
Free cash flow (15%)	Free cash flow/total debt	+	Higher levels of unencumbered cash relative to the debt burden are higher weighted.
Earnings growth (10%)	EBITDA growth/total debt growth	+	In the last five years, growing earnings faster than debt results in greater weighting.

Source: S&P Capital IQ.

Let $item_j$ be the Credit Measure for a Sector $S_k \in \mathcal{S}s.t.\mathcal{S} \subset \hat{\mathcal{G}}$. Denote val_j to be value of $item_j$, and a_j the absolute weight of $item_j$ displayed in brackets next to each $item_j$. Then, determine the issuer weights w.r.t each line $item_j$, denoted $W^{Ii}i(tem_j)$ according to the following formulas:

If the Weight Effect is positive, i.e., "+ " , then:

$$W^{I_i}\big(item_j\big) = \frac{val_j^{I_i \in H} - \min\limits_{H}(val_j)}{\sum_H(val_j^{I_i} - \min\limits_{H}(val_j))} \tag{1.0}$$

If the Weight Effect is negative, i.e., " – ", then:

$$W^{I_i}\big(item_j\big) = \frac{\max\limits_{H}(val_j) - \ val_j^{I_i \in H}}{\sum_H(\max\limits_{H}(\ val_j) - \ val_j^{I_i})} \tag{1.1}$$

Where$H := H^{\mathcal{S}_k,\hat{\mathcal{G}}}$, as per Definition 6, is the set of all Issuers within a fixed sector$\mathcal{S}_k$, within a fixed region $\hat{\mathcal{G}}$, i.e.
$H^{S_k,\hat{\mathcal{G}}}, = \{I_i | I_i \in S_k \subset \hat{\mathcal{G}} \mid k = 1,2,\dots,9\}$

The Issuer – Credit weight for issuer I_i, denoted $W_c^{I_i \in H}$ is given by:

$$W_c^{I_i \in H} = \sum_{q=1}^{|ITEMS|} a_q \,.\, W^{I_i}\left(item_q\right) \tag{2}$$

$$Where\ ITEMS = \left\{set\ containing\ all\ line\ items_q \middle| items_q \subset S_k \in \mathcal{S}\right\}$$

Example: Credit – issuer level weight

Suppose we consider the set of USD-denominated bonds. And, we fix the sector to be Banking. Then let's further suppose for ease of example that results in the following table:

Table 5 – Example – USD denominated, banking sector

	Issuers I_i			
Credit measure	**Bank1**	**Bank 2**	**Bank 3**	**Bank 4**
Size	USD 3.5 mn	USD 2.4 mn	USD 7.6 mn	USD 0.5 mn
Leverage	1.0x	1.2x	0.5x	1.8x

Noting we have:

Sector	$\hat{\mathcal{S}} = \boldsymbol{Banking\ Sector}$
Geography	$\hat{\mathcal{G}} = US\ (USD - denominated\ bonds)$
Line Items	$item_1 = Size, item_2 = Leverage$
Issuers	$I_1 = Bank1\,, I_2 = Bank2\,, I_3 = Bank3\,, I_4 = Bank4\,.$
Values for $Item_1$	$val_1^{I_1} = 3.5, val_1^{I_2} = 2.4, val_1^{I_3} = 7.6, val_1^{I_4} = 0.5.$
Values for $Item_2$	$val_2^{I_1} = 1, val_2^{I_2} = 1.2, val_3^{I_3} = 0.5, val_4^{I_4} = 1.8.$

Issuer weights w.r.t line item 1:

Given $item_1 = size$ has a positive Weight Effect, we refer to **Equation (1.1)**. Weight of $item_1 = size$ w.r.t. $I_1 = Bank\ 1$, denoted by $W^{I_1}(item_1)$, is given by:

$$W^{I_1}(item_1) = \frac{3.5 - 0.5}{(3.5 - 0.5) + (2.4 - 0.5) + (7.6 - 0.5) + (0.5 - 0.5)} = 25\%$$

In a similar fashion we find: $W^{I_2}(item_1) = 15.83\%, W^{I_3}(item_1) = 59.17\%, W^{I_4}(item_1) = 0\%$

Issuer weights w.r.t line item 1:

Given $item_2 = Leverage$ has a negative Weight Effect, we refer to **Equation (1.2)**. Weight of *item*$_2$ = Leverage w.r.t. $I_1 = Bank1$, denoted by$W^{I_1}(item_2)$, is given by:

$$W^{I_1}(item_2) = \frac{1.8 - 1}{(1.8 - 1) + (1.8 - 1.2) + (1.8 - 0.5) + (1.8 - 1.8)} = 29.63\%$$

In a similar fashion we find: $W^{I_2}(item_2) = 22.22\%, W^{I_3}(item_2) = 48.15\%, W^{I_4}(item_2) = 0\%$

Example: Credit – issuer level weight

There are three additional line items (Interest cover, Free cash flow, and Earnings growth), which are calculated in the same manner. Therefore the set $ITEMS = \left\{set\ of\ all\ line\ items\ in\ \hat{\mathcal{S}} = Banking\ Sector\right\}$, and |ITEMS| = 5

To arrive at the Credit – Issuer weight for Issuer $I_1 = Bank1$ i.e.$W_c^{I_1 \in H}$, we take the product of:

- The weight of $(item_k)$ w.r.t. Issuer =I_1, i.e.,$W^{I_1}(item_k)$, and
- The absolute weight of line $item_i$, displayed in brackets next to each line item

And we sum over k , or without loss of generality (W.LO.G.) q. We have explicitly:

$$W_c^{I_1} = \sum_{q=1}^{5} a_q \cdot W^{I_1}(item_q)$$

Therefore,

$$W_c^{I_1} = 25\% \cdot 25\% + 15\% \cdot 29.63\% + 15\% \cdot W^{I_1}(item_3) + 20\% \cdot W^{I_1}(item_4) + 25\% \cdot W^{I_1}(item_5)$$

3.1.2 Valuation Factor

The Valuation Factor increases the % Allocation of Issuers with higher spreads to those with lower ones. Given that sectors have their respective nuances in terms of duration, Issuers have to be compared by eliminating the impact of these nuances in terms of average maturity of their bonds. This section details the methodology with the objective to obtain comparable metrics across issuers.

- Using Definition 5, Let $\Omega^{I_i,S_k,\hat{\mathcal{G}}}$, be the set of all bonds, $bond_j^{I_i}$ over *j* issued by issuer I_i within sectorsS_k, within a fixed geographical region $\hat{\mathcal{G}}$. Then we have: $\Omega^{I_i,S_k,\hat{\mathcal{G}}} = \{bond_j^{I_i \in S_k \subset \hat{\mathcal{G}}} | k = 1,2, \dots, 9|\}$ W.L.O.G. we denote $\Omega = \Omega^{I_i,S_k,\hat{\mathcal{G}}}$

Step 1: Definitions

With reference to **Definition 5**: Let $mat_j^{I_i \in \Omega}$ be the Maturity of $bond_j^{I_i \in \Omega}$ then we define the average Maturity for Issuer $I_i \in \Omega$ by:

$$\overline{mat}^{\,I_i \in \Omega} = \sum_{\Omega} Z_j^{I_i \in \Omega} \cdot mat_j^{I_i \in \Omega} \tag{3.0}$$

Where $Z_j^{I_i \in \Omega}$ is given by:

$$Z_k{}^{I_i} = \frac{AMT\left(bond_k{}^{I_i}\right)}{\sum_{\Omega} AMT\left(bond_k{}^{I_i}\right)} \tag{3.1}$$

With reference to **Definition 4**: Let $OAS_j^{I_i \in \Omega}$ be the option adjusted spread **("OAS")** of $bond_j^{I_i \in \Omega}$ then we define the average OAS for Issuer $I_i \in \Omega$ by.

$$\overline{OAS}^{\,I_i \in \Omega} = \sum_{\Omega} Z_j^{I_i \in \Omega} \cdot OAS_j^{I_i \in \Omega} \tag{4}$$

Step 2: Regression Model

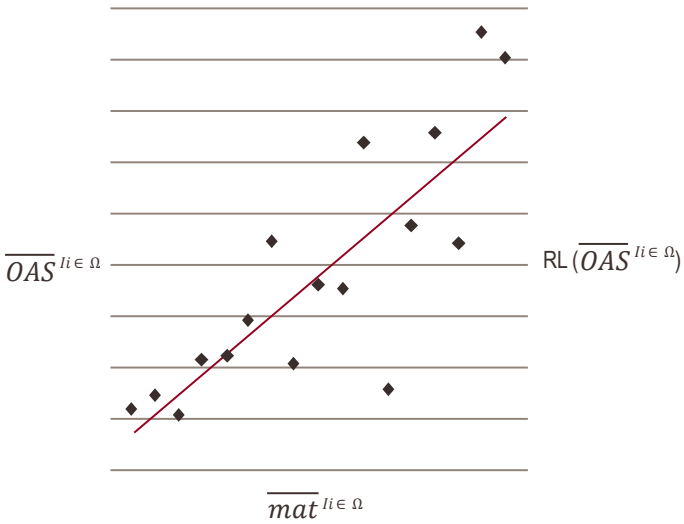
We run a regression model using Ordinary Least Square technique to arrive at the Regression Line $RL\left(\overline{OAS}_j^{\,I_i \in \Omega}\right)$ given by the formula:

$$RL(\overline{OAS}^{\,I_i \in \Omega}) = \alpha_{\hat{s}} + \beta_{\hat{s}} \cdot \log\left(\overline{mat}^{\,I_i \in \Omega}\right) + e^{I_i \in \Omega}, \forall I_i \in \Omega \tag{5}$$

Fig. 3 Linear regression model – ordinary least square

Each point on the graph represents the coordinate of:

a. Average maturity (of bonds) per issuer for a given sector over a fixed region of same currency denominated bonds, and;
b. Average OAS (of bonds) per issuer for a given sector over a fixed region of same currency denominated bonds. Average OAS (of bonds) per issuer for a given sector over a fixed region of same currency denominated bonds.



The Regression Line (RL) is calculated using Ordinary Least Square technique and is calculated for each sector $S_k \subset \delta$, Over a fixed geographical region $\hat{\mathcal{G}}$, such that: $S_k \subset \delta \subset \hat{\mathcal{G}}$.

The $\alpha_{\hat{s}}, \beta_{\hat{s}}$ are fixed per sector per region, but the error term e^{Ii} is unique per issuer per region.

Where:

Estimated parameter $\beta_{\hat{S}}$

Constant over the fixed sector $\hat{S}$

$$\beta_{\hat{S}} = \frac{\sum_{\Omega}\left(\overline{OAS}^{I_i \in \hat{S}} - \overline{\overline{OAS}}^{\hat{S}}\right).\left(\log \overline{mat}^{I_i \in \hat{S}} - \log \overline{\overline{mat}}^{\hat{S}}\right)}{\sum_{\Omega}[\left(\log \overline{mat}^{I_i \in \hat{S}} - \log \overline{\overline{mat}}^{S}\right)]^2} \quad (6.0)$$

Estimated parameter$\alpha_{\hat{S}}$ $\alpha_{\hat{S}} = \overline{\overline{OAS}}^{\hat{S}} - \log \overline{\overline{mat}}^{S}$ (6.1)

Constant over the fixed sector $\hat{S}$

Error terms e^{I_i} are unique for each $e^{I_i} = OAS^{I_i \in \hat{S}} - \alpha_{\hat{S}} - \beta_{\hat{S}} \log mat^{I_i \in \hat{S}}$ (6.2)

Issuer $I_i \in \hat{S} \subset \hat{\mathcal{G}}$

$\overline{\overline{mat}}^{\hat{S}}$ = The arithmetic average $\overline{mat}^{I_i \in \hat{S}}, \forall I_i \in \hat{S}$, i.e., for all issuers I_i over the sector $\hat{S}$, given by

$$\overline{\overline{mat}}^{\hat{S}} = \frac{1}{N}\sum_{q=1}^{N} \overline{mat}^{I_q \in \hat{S}} \quad (6.3)$$

$\overline{\overline{OAS}}$ = The arithmetic average of, $\overline{OAS}^{I_i \in \hat{S}}, \forall I_i \in \hat{S}$ i.e., for all issuers I_i over the sector $\hat{S}$, given by:

$$\overline{\overline{OAS}}^{\hat{S}} = \frac{1}{N}\sum_{q=1}^{N} \overline{OAS}^{I_q \in \hat{S}} \quad (6.4)$$

We define the Fundamental Regression Line $FRL\,(\overline{OAS}^{I_i \in \Omega})$ as the unique spread per issuer I_i as:

$$FRL\,(\overline{OAS}^{I_i \in \Omega}) = \alpha_{\hat{S}} + \beta_{\hat{S}} \cdot \log \overline{\overline{\overline{T}}} + e^{I_i \in \Omega}, \forall I_i \in \Omega \quad (7)$$

Where $\overline{\overline{\overline{T}}}$ ("triple hat") = arithmetic average maturity per issuer over all sector and geographical regions.

Step 3: Transformation of fundamental spreads to weights

For ease of notation we let $\overline{OAS}_F^{I_i} := FRL\,(\overline{OAS}^{I_i \in \Omega})$

The Fundamental Regression Line per Issuer I_i is transformed into a Valuation - Issuer Weight, denoted $W_V^{I_i}$ via the Transformation Function:

$$W_V^{I_i \in \Omega} = \frac{\overline{OAS}_F^{I_i} - \min_{I \in \Omega}(\overline{OAS}_F^{I})}{\sum_{\Omega}\left(\overline{OAS}_F^{I_j} - \min_{I \in \Omega}(\overline{OAS}_F^{I})\right)} \quad (8)$$

3.1.3 Liquidity Factor

Using **Definition 5**, Let$\Omega^{I_i, \mathcal{S}_k, \hat{\mathcal{G}}}$, be the set of all bonds, $bond_j^{I_i} over\ j$ issued by issuer I_i within sector $\mathcal{S}_k$, within a fixed geographical region $\hat{\mathcal{G}}$ Then we have:$\Omega^{I_i, \mathcal{S}_k, \hat{\mathcal{G}}} = \left\{bond_j^{I_i \in \mathcal{S}_k, \subset \hat{\mathcal{G}}} \,\middle|\, k = 1,2, \dots, 9\right\}$ W.L.O.G. we denote $\Omega^{I_i, \mathcal{S}_k, \hat{\mathcal{G}}}$ then define the average liquidity per Issuer I_i to be $\overline{liq}^{I_i}$ s.t.

$$\overline{liq}^{I_i} = \sum_{\Omega} Z_k{}^{I_i}.\, liq_k^{I_i} \quad (9.0)$$

$$Z_k{}^{I_i} = \frac{AMT\left(bond_k^{I_i}\right)}{\sum_{\Omega} AMT\left(bond_k^{I_i}\right)} \quad (9.1)$$

$$liq_k^{I_i} = \frac{P_t^{Ask}(k) - P_t^{Bid}(k)}{P_t^{Bid}(k)} \quad (9.2)$$

Where:

$AMT\ (bond_k{}^{I_i})$ = Amount Outstanding for bond k

$P_k^{Ask}(k)$ = The Asking Price of bond k

$P_t^{Bid}(k)$ = The Bid Price of bond k

The liquidity factor is then transformed into a corresponding weight per Issuer I_i via the Transformation Function:

$$W_L{}^{I_i} = \frac{\max_k\left(\overline{liq}^{I_k}\right) - \overline{liq}^{I_i}}{\sum_{j=1}^{|I_i|}\left(\max_j\left(\overline{liq}^{I_j}\right) - \overline{liq}^{I_j}\right)} \tag{10}$$

3.1.4 Total Issuer – Level Weight

With reference to Figure 1, we can now calculate the Total Issuer – Level Weight, denoted $W^{I_i}(Total)$, i.e., the weight of an Issuer within a particular sector, within a fixed region:$I_i \in \mathcal{S}_k \subset \hat{\mathcal{G}}$ in accordance to the following formula:

$$W^{I_i}\ (total) = 60\% \cdot\ W_c^{I_i} + 20\%\ \cdot\ W_V^{I_i} + 20\%\ \cdot\ W_L^{I_i} \tag{11}$$

3.2. Sector Level

We now calculate the Credit Factor, Valuation Factor and Liquidity Factor w.r.t the **Sector Level**.

3.2.1 Credit Factor

The Sector Level – Credit Weight per sector $\mathcal{S}_k$ for a fixed geographical region $\hat{\mathcal{G}}$ denoted $W_C^{\mathcal{S}_k \subset \hat{\mathcal{G}}}$ is calculated with reference to the Gross Added Value **("GAV"),** and is given by the formula:

$$W_C^{\mathcal{S}_k \subset \hat{\mathcal{G}}} = \frac{GAV_k}{\sum_{j=1}^{9} GAV_j} \tag{12}$$

Where the Gross Added Value is defined in the Appendix: References; Data Definitions and Access.

3.2.2 Valuation Factor

In a similar fashion as the prior sections we start by defining all the Issuers Ii within a sector$\mathcal{S}_k$, with a fixed geographical region $\widehat{\mathcal{G}}$, i.e. $I_i\ \in \mathcal{S}_k \subset \hat{\mathcal{G}}$, or each I_i we already have a unique Fundamental Regression Line, $\overline{OAS}_F^{I_i}$ represented in Equation 10, **Section 2.1.3 Valuation Factors.**

We now define the Average **Issuer-Weighted** Sector-Level Fundamental Regression Line, denoted $\underline{OAS_F^{\mathcal{S}_k}}$ (not be confused with $\overline{\overline{OAS}}^{\hat{\mathcal{S}}}$ which is an **arithmetic average** OAS for the sector). Then:

$$\underline{OAS_F^{\mathcal{S}_k}} = \sum_{I_i \in \mathcal{S}_k \subset \hat{\mathcal{G}}} W^{I_i}\ (total) \cdot\ \overline{OAS}_F^{I_i} \tag{13}$$

Where $w^{I_i}(total)$ has been defined in Equation 13, **Section 2.1.4 Total Issuer-Level Weight**.

The Average **Issuer-Weighted** Sector-Level Fundamental Regression Line is then transformed into a corresponding Valuation-Sector Level weight per sector $\mathcal{S}_k$ within fixed region $\hat{\mathcal{G}}$ via the Transformation Function:

$$W_V{}^{\mathcal{S}_k \subset \hat{\mathcal{G}}} = \frac{\underline{OAS_F^{\mathcal{S}_k}} - \min_{\mathcal{S}_j \subset \hat{\mathcal{G}}}\left(\underline{OAS_F^{\mathcal{S}_j}}\right)}{\sum_{j=1}^{9}\left[\underline{OAS_F^{\mathcal{S}_j}} - \min_{\mathcal{S}_q \subset \hat{\mathcal{G}}}\left(\underline{OAS_F^{\mathcal{S}_q}}\right)\right]} \tag{14}$$

3.2.3 Liquidity Factor

From **Section 2.1.3. Liquidity Factor,** Equation 11 we already have defined $\overline{liq}^{I_i}$, i.e., the average liquidity for Issuer I_i within a sector $\mathcal{S}_k$, within a fixed geographical region$\hat{\mathcal{G}}$. We can also now define – analogous to **Section 2.2.2 Valuation Factor** – the Average **Liquidity-Weighted** Sector-Level value, denoted $\underline{liq}^{\mathcal{S}_k}$ as follows:

$$\underline{liq}^{\mathcal{S}_k} = \sum_{I_i \in \mathcal{S}_k \subset \hat{\mathcal{G}}} W^{I_i}(total) \cdot \overline{liq}^{I_i \in \mathcal{S}_q} \tag{15}$$

The Average **Liquidity-Weighted** Sector-Level value is then transformed into a corresponding Liquidity-Sector-Level Weight per sector $\mathcal{S}_k$ within fixed region $\hat{\mathcal{G}}$ denoted $W_L^{\mathcal{S}_k, \subset \hat{\mathcal{G}}}$ via the Transformation Function:

$$W_L^{\mathcal{S}_k \subset \hat{\mathcal{G}}} = \frac{\max\limits_{\forall \mathcal{S}_j \subset \hat{\mathcal{G}}} \left(\underline{liq}^{\mathcal{S}_j}\right) - \underline{liq}^{\mathcal{S}_k}}{\sum_{q=1}^{9} \left[\max\limits_{\forall \mathcal{S}_j \subset \hat{\mathcal{G}}} \left(\underline{liq}^{\mathcal{S}_j}\right) - \underline{liq}^{\mathcal{S}_k}\right]} \tag{16}$$

3.2.4 Total Sector – Level Weight

With reference to Figure 1, we can now calculate the Total Sector – Level Weight, i.e., final weight of an Issuer within a particular region, within a fixed region, denoted $W^{\mathcal{S}_k}(Total)$, with $\mathcal{S}_k \subset \hat{\mathcal{G}}$, in accordance to the following formula:

$$W^{\mathcal{S}_k \subset \hat{\mathcal{G}}}(total) = 60\% \cdot W_C^{\mathcal{S}_k \subset \hat{\mathcal{G}}} + 20\% \cdot W_V^{\mathcal{S}_k \subset \hat{\mathcal{G}}} + 20\% \cdot W_L^{\mathcal{S}_k \subset \hat{\mathcal{G}}} \tag{17}$$

Remark: We note that the final weight of an Issuer within a particular region is given by: $W^{I_i \in \mathcal{S}_k}(total) \cdot W^{\mathcal{S}_k \subset \hat{\mathcal{G}}}(total)$

3.3. Geographical Level

We now calculate the Credit Factor, Valuation Factor and Liquidity Factor w.r.t the **Geographical Level.**

3.3.1 Credit Factor

Let $W_C^{\hat{\mathcal{G}}}$ be the Geographical-Credit Weight, or as per Figure 1 the Currency Credit % Allocation. Then:

$$W_C^{\mathcal{G}_k} = \frac{PPPGDP_k}{\sum_{q=1}^{3} PPPGDP_q} \tag{18}$$

Where:

$PPPGDP_j = GDP - PPP$ of country i , as defined in **APPENDIX, References, Data Definitions and Access**

3.3.2 Valuation Factor

With reference to Definition 6:

Let H $\mathcal{S}_k, \hat{\mathcal{G}}$ be the set of all Issuers within a fixed sector $\mathcal{S}_k$, within a fixed region $\widehat{\mathcal{G}}$, i.e. $H^{\mathcal{S}_k, \hat{\mathcal{G}}} = \left\{I_i \middle| I_i \in \mathcal{S}_k \subset \hat{\mathcal{G}} \middle| k = 1,2, \dots, 9\right\}$. Let $B^{I_i \in \Omega}$ be the set of all bonds issued by issuer $I_i \in H$, and $bond_j^{I_i} \in B^{I_i \in \mathrm{H}}$ denote the individual bond issued by Issuer I_i belonging to the set H. Then we define the weight of such bond $wgt\left(bond_j^{I_i}\right)$ to be:

$$wgt\left(bond_j^{I_i}\right) = W^{I_i}(total) \cdot W^{\mathcal{S}_k}(total) \cdot \alpha_j^{I_i} \tag{19}$$

Where AMT means Amount Outstanding per bond.

$$Z_j^{I_i} = \frac{AMT\left(bond_j^{I_i}\right)}{\sum_{B^{I_i}\in\Omega} AMT\left(bond_q^{I_i}\right)} \tag{19.1}$$

Then by construction we have:

$$\sum_{\mathcal{S}_k\in\mathcal{S}} W^{\mathcal{S}_k}(total) \sum_{i=1}^{|I_i\in\mathcal{S}_k|} W^{I_i}(total) \sum_{j=1}^{|B^{I_i\in H}|} \alpha_J^{I_i} = 1 \tag{19.2}$$

The Average Issuer-Weighted Geographical-Level Fundamental Regression Line is then transformed into a corresponding geographical – valuation weight for region $\mathcal{G}_k \in \hat{\mathcal{G}}$ denoted $W_v^{\mathcal{G}_k\in\hat{\mathcal{G}}}$ via the Transformation Function:

$$W_V^{\mathcal{G}_k\subset\hat{\mathcal{G}}} = \frac{OAS_F^{G_k}}{\sum_{q=1}^{3} OAS_F^{G_q}} \tag{20}$$

Where OAS has been defined in equation 13.

3.3.3 Liquidity Factor

The average liquidity for a fixed geographical region, denoted by $\overline{liq}^{\hat{\mathcal{G}}}$ is given by:

$$\overline{liq}^{\hat{\mathcal{G}}} = \sum_{\mathcal{S}_k\in\mathcal{S}} W^{\mathcal{S}_k}(total) \sum_{i=1}^{|I_i\in\mathcal{S}_k|} W^{I_i}(total) \sum_{j=1}^{|B^{I_i\in\Omega}|} liq_J^{I_i} \tag{21}$$

Where $liq_j^{I_i}$ has been previously defined in Equation 11.2, **Section 2.1.3 Liquidity Factor.**

The Average liquidity value for a region, $\overline{liq}^{\hat{\mathcal{G}}}$ is then transformed into a corresponding geographical – liquidity weight for region $\mathcal{G}_k \in \hat{\mathcal{G}}$ denoted $W_L^{\mathcal{G}_k\in\hat{\mathcal{G}}}$ via the Transformation Function:

$$W_L^{\mathcal{G}_k\in\hat{\mathcal{G}}} = \left(\frac{2}{3} - \frac{\overline{liq}^{\mathcal{G}_k}}{\sum_{q=1}^{3} \overline{liq}^{\mathcal{G}_q}}\right) \tag{22}$$

3.3.4 Total Geographical – Level Weight

With reference to Figure 1, we can now calculate the Total Geographical–Level Weight, i.e., the final weight of geography $\mathcal{G}_k$ denoted $w^{\mathcal{G}_k}(Total)$, with $\mathcal{G}_k \in \mathcal{G}$, in accordance to the following formula:

$$W^{\mathcal{G}_k\subset\hat{\mathcal{G}}}(total) = 60\% \cdot W_C^{\mathcal{G}_k\subset\hat{\mathcal{G}}} + 20\% \cdot W_V^{\mathcal{G}_k\subset\hat{\mathcal{G}}} + 20\% \cdot W_L^{\mathcal{G}_k\subset\hat{\mathcal{G}}} \tag{23}$$

Remark: We note that the final weight of sector $\mathcal{S}_k$ within a particular region is given by: $W^{\mathcal{S}_k\subset\hat{\mathcal{G}}}(total) \cdot W^{\hat{\mathcal{G}}}(total)$

3.4. Total Factor Weights

Define the Total Factor Weight per Factor Level (Credit, Valuation, and Liquidity) for Issuer I_i s.t. $I_i I_i \in \mathcal{S}_k \subset \hat{\mathcal{G}}$ As follows:

Total Credit Factor Weight w.r.t Issuer I_i

$$W_C^{I_i}(total) = W_C^{I_i} \cdot W_C^{\mathcal{S}_k} \cdot W_C^{\hat{\mathcal{G}}} \tag{24.0}$$

Total Valuation Factor Weight w.r.t Issuer I_i

$$W_V^{I_i}(total) = W_V^{I_i} \cdot W_V^{S_k} \cdot W_V^{\hat{\mathcal{G}}} \tag{24.1}$$

Total Liquidity Factor Weight w.r.t Issuer I_i

$$W_L^{I_i}(total) = W_L^{I_i} \cdot W_L^{S_k} \cdot W_L^{\hat{\mathcal{G}}} \tag{24.2}$$

3.4.1 Soft Caps – Factor Weights

Each Factor Weight has a "soft" cap, i.e., the cap restraint is not binding, s.t. all the weights for a fixed Total Factor Weight are capped at 4%. All the excess weight is redistributed in proportion to each Issuers' Total Factor Weight. Let $n = \left|I_i \in S_k \subset \hat{\mathcal{G}}\right|$, then the soft capping is calculated as follows:

$$cap\ W_F^{I_i}(total) = \min\left(W_F^{I_i}, 4\%\right) + W_F^{I_i} \cdot \frac{sumExess}{sum\ Total} \tag{25.0}$$

$$sumExess = \sum_{i=1}^{n} \max\left(W_F^{I_i} - 4\%, 0\right) \tag{25.1}$$

$$sumTotal = \sum_{i=1}^{n} W_F^{I_i} \tag{25.2}$$

3.5. Final Issuer Weights

The final weights per Issuer I_i (before applying factor caps) denoted $wgtFinal\ (I_i)$ is given by:

$$wgtFinal(I_i) = 60\% \cdot capW^{I_i}(total) + 20\% \cdot W^{S(I_i)}(total) + 20\% \cdot W^{\mathcal{G}(S(I_i))}(total) \tag{26}$$

Where: $S(I_i)$ maps I_i to some sector S, and $\mathcal{G}(S(I_i))$ maps $S(I_i)$ to some region $\mathcal{G}$

3.6. Final Bond Weights

The final weight for $bond_j^{I_i}$, where $I_i \in S_k \subset \hat{\mathcal{G}}$, denoted $wgtFinal\left(bond_j^{I_i}\right)$ is calculated as follows:

$$wgtFinal\left(bond_j^{I_i}\right) = wgtFinal(I_i) \cdot \frac{AMT\left(bond_j^{I_i}\right)}{\sum_{q=1}^{|I_i|} AMT\left(bond_q^{I_i}\right)} \tag{27}$$

4. Final Remarks

The Index is rebalanced twice a year, on the last Business Day of May and November.

- Credit data are updated twice a year in April and October, which impacts the rebalancing for the following May
- Economic data that are used to compute the sector weights are updated once a year in October, which impacts the rebalancing for the following Novemeber

Part V: Building the Fundamental Fixed Income Government Indices

Overview

The Fundamentally Weighted Fixed Income Government Indices use fundamental information to measure the potential solvency of each country in the Eligible Government Universe; gathering together economic and financial data. The weight that the Index allocates to each country reflects the assessment of this data. Table 1 below displays the breakdown in country weights attributable to each line item (or "factor"): (i) Credit – accounting for 50% of the total weight, (ii) Social/Demographic (20%) and (iii) Macro (30%). Factors are defined as per the IMF, United Nations and World Bank; full definitions and data access is described in the Appendix.

1. Determining the Country Credit and Social/Demographic Weights

Let U be the set of all countries in the Sovereign Eligible Country Universe, and $|U|$ the number of elements, i.e., countries, in this set. Then: The Sovereign Eligible Country Universe is ranked from "best" to "worst" based on each line item (or "factor") in Table 1, i.e., we have nine separate ordered lists. Depending on the relationship of the target weight to each line item (or "factor"), we have:

- (+) Denotes a positive relationship between the target country weight and the specific factor. Meaning the ranking of the Sovereign Eligible Country Universe by this factor is an ordered list from highest to lowest value. Highest value receiving a $rank = 1$, and lowest value receiving a rank $= |U|$
- (–) Denotes a negative relationship between the target country weight and the specific factor. Meaning the ranking of the Sovereign Eligible Country Universe by this factor is an ordered list from lowest to highest value. Lowest value receiving a $rank = 1$, and highest value receiving a rank $= |U|$

Table 1 – Factor Weights

Credit Factors		Social/Demographic Factors		Macro Factors	
Public Debt to GDP Ratio (–)	15%	Political Stability (+)	10%	PPPGDP (+)	30%
Net International Investment Position (+)	15%	Old Age Dependency Ratio (–)	5%		
Fiscal Balance (+)	10%	Misery Index (–)	5%		
Private Debt to GDP Ratio (–)	5%				
Current Account Balance (+)	5%				

Source: IMF, World Bank, United Nations. See Appendix for full definitions and data access.

The Credit and Social/Demographic factors are converted into weights via the exponential transformation:

$$w_i^{C,S\&D} = \alpha \,.\, exp\left(-0.05 \sum_{k=1}^{8} \left(fw_k^i \cdot rank_k^i\right)\right) \quad \text{: For each} \quad i \in U \tag{1.0}$$

$$where\ a\ constant, \alpha, is\ chosen\ s.t. \sum_{i=1}^{|U|} w_i^{C,S\&D} = 1 \tag{1.1}$$

Where:

$w_i^{C,S\&D}$ = Credit and Social/Demographic weights associated with country i.

fw_k^i = Corresponding Factor Weight associated with country i.

$rank_k^i$ = Rank of country i w.r.t. Factor k.

$|U|$ = Number of countries in the set U, where U = Sovereign Eligible Country Universe.

1.1. Determining the Country Macro Factor Weights

The Macro Factor weights associated with each country i, are converted into a weight via the function:

$$W_i^M = \frac{PPPGDP_i}{\sum_{j=1}^{N} PPPGDP_j} \tag{2}$$

Where

W_i^M = Macro weight associated with country i

$PPPGDP_j$ = GDP-PPP of country i as defined in **APPENDIX, References, Data Definitions and Access**

N = Number of countries in the Sovereign Eligible Country Universe

1.2. Determining the Fundamental Weights

The Fundamental Weights per country i, $\mathrm{W_i^{Fdtl}}$, are calculated by combining the Macro Factor Weights per country i, previously denoted $\mathrm{W_i^M}$ with the Credit and Social/Demographic Factor Weights, previously denoted $W_i^{C,S\&D}$ as follows:

$$W_i^{Fdtl} = 30\% \cdot W_i^M + 70\% \cdot W_i^{C,S\&D} \quad (3)$$

The countries with the lowest fundamental weights are removed up to a 5% allocation. The remaining fundamental weights are rebased such that the sum of the Fundamental Weights sums to 100%.

2. Factor Adjustments

2.1 Liquidity Adjustment

Using **Definition 5**, Let $\Omega^{I_i S_k \hat{\mathcal{G}}}$ be the set of all bonds, $bond_j^{I_j} over\ j$ issued by issuer I_i within sector, S_k within a fixed geographical region $\hat{\mathcal{G}}$

Then we have: $\Omega^{I_i S_k \hat{\mathcal{G}}} = \{bond_j^{I_j \in S_k, \hat{\mathcal{G}}} | k = 1,2, \dots, 9\}$ W.L.O.G. we denote $\Omega = \Omega^{I_i, S_k, \hat{\mathcal{G}}}$ then define the average liquidity per Issuer I_i to be $\overline{liq}^{I_i}$ s.t.

$$\overline{liq}^{I_i} = \sum_{\Omega} \alpha_k^{I_i} \cdot liq_k^{I_i} \quad (4.0)$$

$$\alpha_k^{I_i} = \frac{AMT\left(bond_k^{I_i}\right)}{\sum_{\Omega} AMT\left(bond_k^{I_i}\right)} \quad (4.1)$$

$$liq_k^{I_i} = \frac{P_t^{Ask}(k) - P_t^{Bid}(k)}{P_t^{Bid}(k)} \quad (4.2)$$

Where:

$AMT\left(bond_k^{I_i}\right)$ = Amount Outstanding for bond k

$P_k^{Ask}(k)$ = The Asking Price of bond k

$\mathrm{P_t^{Bid}}(k)$ = The Bid Price of bond k

The Fundamental Weights are adjusted to take into account the market liquidity for bonds in that country:

$$W_i^{Fdtl}(liqAdj) = \frac{2^{-\overline{liq}^{I_i} \cdot W_i^{Fdml}}}{\sum_{J=2}^{N} 2^{\overline{-liq}^{I_i} \cdot W_j^{Fdml}}} \quad (5)$$

If the following inequality **Liquidity Test** is not satisfied for any i, then $\overline{liq}^{I_i}$ is replaced with $\mu \cdot \overline{liq}^{I_i}$, where μ <1 is a constant such

Liquidity Test

$$\sqrt{\frac{\sum_{i=1}^{N}(W_i^{Fdtl}(liqAdj) - W_i^{Fdtl})^2}{\sum_{i=1}^{N}(W_i^{Fdtl})^2}} \leq 20\% \quad (6)$$

That the Liquidity Test becomes equality and is equal to 20%.

2.2 Value Adjustment

By Adjusting the fundamental weights for the expected yield of each country, the Index adds a "market perception" layer to its fundamental core weighting scheme.

$$E(R_i) = YTM_i + E(CA_i) \quad (7.0)$$

$$E(CA_i) = E(CPI^{Base})_i - E(CPI^{Domestic})_i + 0.07 \cdot ln\frac{Market\_Rate_i}{PPP\_Implied\_rate_i} \quad (7.1)$$

Where:

$E(CPI^{Base})_i$	**Expected CPI** for United States, as defined in section: **Reference: Table 1: Data Definitions and Access**
$E(CPI^{Domestic})$	**Expected CPI** for country *i*, as defined in section: **Reference: Table 1: Data Definitions and Access**
$Market\_Rate_i$	**Market Rate** as defined in section:ss **Reference: Table 1: Data Definitions and Access**
$PPP\_implied\_rate_i$	**PPP Implied Rate** as defined in section: **Reference: Table 1: Data Definitions and Access**

By adjusting the $W_i^{Fdtl}(liqAdj)$ by the Value Adjustment Factor $valAdj_i$, we arrive at the Value Adjusted Weight for country i, denoted $W_i^{val-adj}$ by applying the function:

$$W_i^{val-adj} = W_i^{Fdtl}(liqAdj) \times valAdj_i \quad (8.0)$$

Where: $valAdj_i = [c + E(R_i)]^b$ (8.1)

AND

(i) c is chosen to satisfy equation (2.8):

$$[c + Max_i E(R_i)] \Big/ [c + Min_i E(R_i)] = 2 \quad (8.2)$$

(ii) b is chosen to satisfy equation (2.9):

$$\sqrt{\frac{\sum_{i=1}^{N}\left(W_i^{val-adj} - W_i^{Fdtl}(liqAdj)\right)^2}{\sum_{i=1}^{N}\left(W_i^{Fdtl}(liqAdj)\right)^2}} = \leq 20\% \quad (8.3)$$

LOIM Fundamental Emerging Local Currency Index

For the LOIM Fundamental Emerging Local Currency Index, there is an additional hard cap of 10% per Issuer weight, with a 5% hard cap for specifically Nigeria. Any excess weight is redistributed amongst the remaining Issuers in proportion to each Issuers weight in the Index.

2.3 Investability Adjustment

The final weight of country *i* in the Index, W_i^{Final} is equal to the value adjusted weight as per equation (2.70) after applying the Investability Constraint, defined as:

Investability Constraint

$$W_i^{Final} = W_i^{val-adj} \leq 1\% \times \frac{MCap_i}{Nav^{Max}} \quad (9.0)$$

$$MCap_i = \sum_{k=1}^{|H^i|} AMT_k^i \cdot \left(P_k^i + AI_k^i\right) \quad (9.1)$$

Where:

$MCap_i$ = Market Capitalization of country i

H^i = The set of all Bonds issued (and applicable) in country i

$|H^i|$ = The number of elements, i.e., Bonds, in H^i

P_k^i = The Clean Price of $\mathrm{Bond_k}$ where: i.e., $Bond_k \in H^i and\ k = 1,2, \ldots |H^i|$

$\mathrm{AI_k^i}$ = The Accrued Interest of $\mathrm{Bond_k}$ where: $Bond_k \in H^i and\ k = 1,2, \ldots |H^i|$

$\mathrm{Nav^{max}}$ = $\begin{cases} USD\ 1bn, for\ Euro\ or\ Global \\ USD\ 540mn, for\ Emerging\ Market \end{cases}$

$\mathrm{AMT_k^i}$ = Amount Outstanding for each $Bond_k$

Any excess weight after the Investability Constraint has been applied is redistributed in proportion to each $W_i^{val-adj}$ value in the Index.

3. Final Bond Weights

The final Index Component (Bond) weights k per country $i, Wgt(Bond)_k^i$ are calculated as follows:

$$Wgt(Bond)_k^i = W_t^{Final} \cdot \frac{MCap_k^i}{\sum_{j=1}^{N_i} MCap_k^i} \ for\ k = 1\ to\ |H^i| \quad (10)$$

Where:

AMT_k^i = Amount Outstanding for $\mathrm{Bond_k}$ where: $\mathrm{Bond_k \in H^i and\ k = 1,2, \ldots |H^i|}$

$|H^i|$ = The number of elements, i.e., Bonds, in H^i

4. Historic Default Penalty Capping

For the LOIM Fundamental Emerging Local Currency Index, there is a specific process by which countries that have a recent history of defaulting are introduced to the index following an initial review period and with the approval of the LOIM Index Oversight Committee. Any country that is eligible for inclusion into the index and that meets the fundamental weight criteria, but has a recent history of defaulting, are included into the index gradually with a reduced fundamental weight. 50% of its fundamental weighting at first inclusion date (either April or October hard rebalance points), 75% after 1 year and 100% after 2 years. Any country entering the index will only reach 100% of its fundamental weighting after a two-year inclusion period.

5. Final Remarks

The Index is rebalanced on the last Business Day of the calendar month. For the full rebalance process please refer to **PART VI, Index Calculation, Section 3.2**.

Part VI: Index Calculations

1. BVAL Overview

All index returns and characteristics are ultimately derived based on BVAL bond prices. The indexes utilize 3pm BVAL. Market values are computed for each bond by multiplying the outstanding amount by that day's BVAL price plus accrued interest.

1.1 BVAL Pricing

Bloomberg's BVAL Evaluated Pricing Service provides transparent and highly defensible prices for fixed income securities across the liquidity spectrum. The foundation of BVAL's methodology is its access to a wealth of market observations from thousands of contributed sources. This mass of market data is the main driver of Bloomberg's innovative and quantitative approach that first prices actively traded financial instruments and then derives a price on comparable financial instruments that trade less frequently. This methodology aligns with Bloomberg's tried-and-tested capabilities as the financial industry's leading analytics platform and source of fixed income information. In addition to sophisticated algorithms that generate prices, the BVAL methodology assigns a BVAL Score based on the quantity and quality of market data used.

1.2 The BVAL Score

An important and complementary component of the Bloomberg Valuation Service is the BVAL Score. This innovative, proprietary metric is designed to provide subscribers with a consistent and quantifiable means of assessing the market data supporting each BVAL price. The BVAL Score scale ranges from 1 to 10, reflecting the relative quantity and strength of the market data used to generate the BVAL Price. The quantity and quality of the market data are measured using BVAL's proprietary "Effective Number" and "Standard Deviation" calculations. Effective Number – reflects the number of quality observations used in deriving the BVAL Score. The "quality" of each observation is measured using various attributes, including timeliness, lot size and quote type (e.g., trades versus broker levels). The Effective Number is the weighted sum of the quality score for the individual quotes used in the BVAL price. Standard Deviation – is a metric that captures the consistency of market input observations, indicating the degree of corroboration or dispersion among the supporting market data. Full methodology and user manuals for BVAL can be found on the Bloomberg terminal by going to BVLI<Go>.

2. BVAL Index Calculations

2.1 Currency Return

The Currency Return Rate for Index Constituent i on Index Business Day t, denoted by $ccy\_rr_t^i$, is defined as:

$$ccy\_rr_t^i = \frac{FX_t^i}{FX_{t-1}^i} - 1 \quad (1)$$

Where $FX_t^{i_i}$ is the official **BFIX** foreign currency rate on Index Business Day t, which converts one unit of local currency of Index Constituent i into the Index Currency, denoted by $[base\ CCY]$

2.2 Unhedged Base Currency Total Return Rate

The Total Return Rate $\boldsymbol{trr}$ for Component (Bond) $\boldsymbol{i}$ on Index Business Day $\boldsymbol{t}$ converted into the Base Currency $[base\ CCY]$, denoted by $[base\ CCY]\_trr\_Bond_t^i$ is defined as:

$$[base\ CCY]\_trr\_Bond_t^i = \left[\left(1 + loc\_trr\_Bond_t^i\right) \cdot \left(1 + ccy\_rr_t^i\right)\right] - 1 \quad (2)$$

Where $loc\_trr\_Bond_t^i$ means the Total Return Rate for Index Constituent (Bond) $\boldsymbol{i}$ on Index Business Day $\boldsymbol{t}$ in the local currency.

2.3 Unhedged Local Currency Bond Total Return

The daily unhedged $\boldsymbol{local}$ (loc) currency $\boldsymbol{total\ return\ rate}$ (trr) for Index Component $\boldsymbol{i}$ from Index Business Day $\boldsymbol{t} - \boldsymbol{i}$ to $\boldsymbol{t}$, denoted $loc\_trr\_Bond_{t-1}^i$, is defined as:

Where, w.r.t. Index Component i on Index Business Day :

$\mathrm{IR}_{t,t-1}^{i}$ = Interest Return accrued from Index Business Day $\boldsymbol{t} - \mathbf{1}$ to $\boldsymbol{t}$;

$PR_{t,t-1}^i$ = (clean) Price Return from Index Business Day $\boldsymbol{t} - \mathbf{1}$ to $\boldsymbol{t}$;

Interest Return

$$cIR_{t,t-1}^{i} = \begin{cases} \frac{AI_t^i - AI_{t-1}^i}{100} \; \forall \; t \; \neq \tau^i \\ \frac{C_t^i - AI_{t-1}^i}{100} \qquad else \end{cases} \tag{4.0}$$

Price Return

$$PR_{t,t-1}^{i} = \frac{P_t^i - P_{t-1}^i}{100} \tag{4.1}$$

Where, w.r.t. Index Component $\boldsymbol{i}$ on Index Business Day $\boldsymbol{t}$:

Nom_t^i = Nominal Amount

P_t^i = Official **BVAL** 4pm Eastern Standard Time (4pm EST) Clean Price;

AI_t^i = Cumulative Accrued interest up to and including Index Business Day $\boldsymbol{t}$

C_t^i = Coupon Amount

τ^i = Coupon Detachment Date

2.4 Portfolio Total Return in Base Currency

The daily total return of the bond portfolio in the Base Currency from Index Business Day $\boldsymbol{t-1}$ to $\boldsymbol{t}$, denoted by $[baseCCY]\_portTR_{t,t-1}$ is defined as:

$$[baseCCY]\_portTR_{t,t-1} = \sum_{i=1}^{n_{t-1}} w_{t-1}^i \cdot [baseCCY]\_trr\_Bond_t^i \tag{5}$$

With: $$\sum_{i=1}^{n_{t-1}} w_{t-1}^i = 1 \tag{5.1}$$

Where:

w_{t-1}^i = Weight of Index Component (Bond) $\boldsymbol{i}$ as of Index Business Day $\boldsymbol{t}$

$\mathrm{n_{t-1}}$ = Number of Index Components in the bond portfolio as of Index Business Day $\boldsymbol{t}$

2.5 Bond Market Value

The effective weight of each bond $\boldsymbol{i}$ in portfolio as of Index Business Day $\boldsymbol{t}$, denoted w_t^i is given by:

$$w_t^i = \frac{MV_t^i}{\sum_{i=1}^{n} MV_t^i} \tag{6}$$

$$With: MV_t^i = Nom_t^i \cdot \left(P_t^i + AI_t^i\right)/100 \tag{6.1}$$

Where:

MV_t^i = Market Value of Index Component (Bond) $\boldsymbol{i}$ on Index Business Day $\boldsymbol{t}$

2.6 Total Return Index Value

The daily official total return Index Value ($\_trIV$) in the $[baseCCY]$ on Index Business Day $\boldsymbol{t}$, denoted by $[baseCCY]\_trIV_t$, is defined as:

$$[baseCCY]\_trIV_t = [baseCCY]\_trIV_{t-1} \cdot (1 + [baseCCY]\_portTR_t) \quad (7)$$

2.7 Corporate Actions & Distributions

Corporate actions such as principal pay-downs and coupon payments are included. Extraordinary actions would include issuer defaults. If a company missed a payment it is not included in the total return of the index and if a bond goes into default it would be removed from the index at next rebalance.

All coupon payments, redemptions, pay-downs, calls, and other forms of cash flow are assumed reinvested in the Index upon receipt equal to the weighted average of the bonds in the Index.

3. Currency-hedged Indices

The table below **TABLE 1 CURRENCY-HEDGED INDICES**, displays the indices which are currency hedged at the portfolio level, meaning the currency of each Index Constituent, i.e., bond, is hedged into hedged currency, here the "**Index Hedged Currency**." The currency hedging overlay is rebalanced on the last Business Day of each calendar month, here such date denoted by t_o.

3.1 Currency Return

The Currency Return Rate for Index Constituent $\mathbf{i}$ over a closed time window $[\tau, t]$, where $\tau < t$ denoted by $\mathcal{C}^i_{\tau,t}$, is defined as:

$$\mathcal{C}^i_{\tau,t} = \frac{FX^i_t}{Fx^i_{t_o}} - 1 \quad (8)$$

Where:

$FX^i_t =$ The official BFIX foreign currency rate on Index Business Day t, which converts one unit of currency of Index Constituent i into the Index Hedged-Currency.

t_o = The last Business Day of the calendar month $m-1$, where m is the calendar month in which Business Day t resides.

3.2 Currency Return on Unhedged Local TR

Let $B^i_{\tau,t}$ be the local total return of Index Constituent (bond) i over the closed time window $[\tau, t]$, where $\tau < t$, then we calculate the currency return on the unhedged local total return of Index Constituent i, denoted by $\mathcal{U}^i_{r,t}$, in accordance with the following formula:

$$\mathcal{U}^i_{\tau,t} = \mathcal{C}^i_{\tau,t} \cdot \left(1 + \mathcal{B}^i_{\tau,t}\right) \quad (9)$$

3.3 Forward Contract Return

We define the forward contract return over a closed time window $[\tau, t]$, where $\tau < t$, denoted by $F\tau,^i_t$, to be:

$$F\tau,^i_t = \frac{rate^i_{t_o}}{FX^i_{t_o}} - 1 \quad (10)$$

Where:

$rate^i_{to}$ Bloomberg 4pm London time forward rate on Business Day t_o

FX_{to} Official BFIX foreign currency rate on Index Business Day t_o, which converts one unit of currency of Index Constituent i into the Index Hedged-Currency

3.4 Hedge Ratio

The Hedge Ratio of Index Constituent (bond) i over the closed time window $[\tau, t]$, where $\tau < t$, denoted $H\tau,^i_t$, is defined as the difference between the Forward Contract Return and the Currency Return, with resultant value multiplied by the Hedge Percentage, i.e.

$$H\tau,^i_t, = h\% \cdot \left(F\tau,^i_t - \mathcal{C}\tau,^i_t\right) \quad (11)$$

Where: $h\% = 100\%$ss

3.5 Hedged Total Return

The hedged total return attributed to Index Constituent (bond) i over the closed time window $[\tau, t]$, where $\tau < t$, can then be determined by taking the triple sum of the (i) local total return, (ii) currency return on the unhedged local total return, and (iii) hedge ratio:

$$\widehat{\mathcal{B}}^{i}_{\tau,t} = \mathcal{B}^{i}_{\tau,t} + \mathcal{U}^{i}_{\tau,t} + \mathcal{H}^{i}_{\tau,t} \tag{12}$$

3.6 Final Currency Hedged Index Level

The level of the hedged total return index on Business Day t, dependent upon being rebalanced – with respect to the currency-hedge overlay – on Business Day t_o, denoted by $\mathrm{Index}^{\mathrm{Hedge}}_{t,t_o}$, is given by the following formula:

$$Index^{Hedged}_{t,t_o} = Index^{Hedged}_{t-1,t_o} \cdot \left(1 + \sum_i w^i_{t_o} \cdot \widehat{\mathcal{B}}^{i}_{\tau,t}\right) \tag{13}$$

$$\sum_i W^i_{t_o} = 1$$

where:

$w^i_{t_o}$ The weight of Index Constituent (bond) i on Business Day t_o

4. Index Rebalance Process

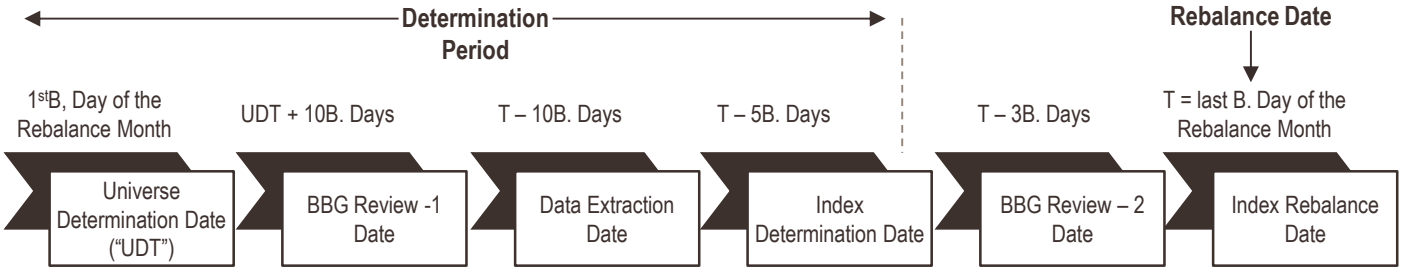
4.1 Corporate Bond Indices

The Corporate Bond Indices rebalance semi-annually, on the last Business Day of May, and the last Business Day of November. Credit data is updated twice a year in May & November which impacts the end of month rebalancing for the May & November respectively."

The LOIM Credit Bond Indices go through an Index Discovery Schedule (the "**Schedule**"), as depicted in **Figure 1: Index Discovery Schedule**. The Schedule starts from and includes the first Business Day of the calendar month in which the Rebalance Date occurs (the "**first Business Day**"), and ends on and includes the Index Rebalance Date. Within the Schedule there is the Determination Period: Starting on the first Business Day and ending on the Index Determination Date.

Given the volume of data which is required, the computations which determine the individual bond weights are run over a maximum of 5 Business Days, from the Data Extraction Date to the Index Determination Date, however all data used already pertains to past dates, being the Universe Determination Date and the Data Extraction Date itself. It is important to review each component arrow of the Determination Period so that it is understood to which date data pertains.

Fig. 1 Corporate index discovery schedule



Corporate Index Discovery Schedule

Universe Determination Date: The Eligible Corporate Universe is determined by using the methodology as outlined in **PART IV: Building the Fundamental Fixed Income Corporate Indices**. Data items which are identified therefore have values pertaining to this date. The data items are:

- Amount Outstanding
- Credit Rating
- LOIM Corporate Sector identification

See **APPENDIX: Key Terms and Definitions** for full details for these data items. On this date the Eligible Corporate Universe is sent to Bloomberg for review.

BBG Review-1 Date: Bloomberg returns the Eligible Corporate Universe less those bonds/issuers for which there is no or inadequate BBG data coverage. At this point, the Eligible Corporate Universe is now confirmed. Note, only the Eligible Index Components are identified, their target weights will be determined in the steps to follow.

Data Extraction Date: Data items are extracted and therefore their values pertain to this date. The data items are:

- BVAL bond prices
- Option Adjusted Spreads
- Bid Price
- Ask Price
- Yield to Maturity
- Maturity

See **APPENDIX: Key Terms and Definitions** for full details for these data items.

Index Determination Date: All bonds weights have been determined. Index Components (Bonds) and their respective target weights are sent to Bloomberg.

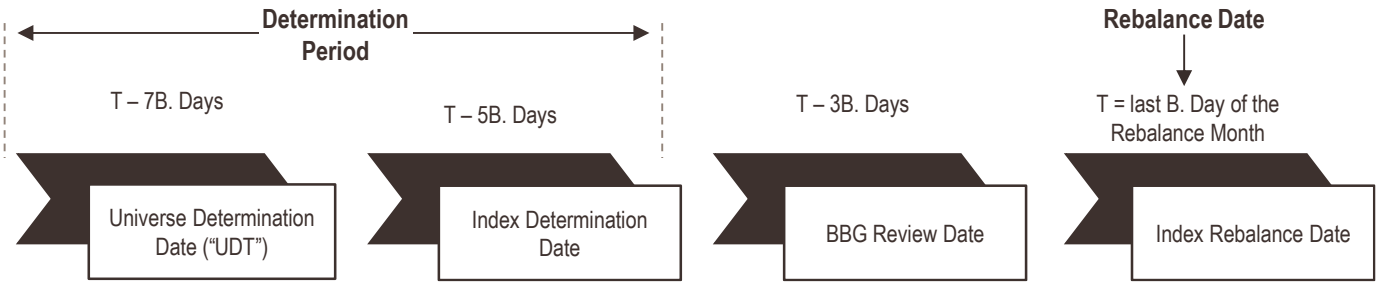
BBG Review-2 Date: Bloomberg reviews, for the second time, all Index Components to ensure the data coverage.

Index Rebalance Date: The Index is rebalanced. BVAL Prices which pertain to this date are used in the rebalance calculation.

4.2 Government Bond Indices

The LOIM Government Bond Indices go through an Index Discovery Schedule (the "**Schedule**"), as depicted in **Figure 2: Index Discovery Schedule**, below, in a similar fashion as to the Corporate Discovery Process. The Indices are rebalanced on the last Business Day of each calendar month.

Fig. 2 Government index discovery schedule



Universe Determination Date: The Eligible Government Universe is determined by using the methodology as outlined in **PART VI: Building the Fundamental Fixed Income Government Indices.** Data items which are identified therefore have values pertaining to this date. The data items are the macro-economic items as explained in **PART II: Eligible Government Universe**.

Index Determination Date: All bonds weights have been determined. Index Components (Bonds) and their respective target weights are sent to Bloomberg.

BBG Review Date: Bloomberg reviews all Eligible Index Components to ensure the data coverage.

Index Rebalance Date: The index is rebalanced. BVAL Prices which pertain to this date are used in the rebalance calculation.

Appendix

Key terms and definitions

Table 1 – key terms and definitions

Key Terms	Detail
Index Oversight Committee	The committee at LOIM whose roles and responsibilities are outlined in Section 1 of this Methodology
Calculation Agent	Bloomberg or any appointed successor thereto
Business Day	A weekday, i.e., Monday to Friday inclusive, irrespective of holidays in the local markets
Supervisory Index Committee	A committee comprised of Bloomberg persons who deal with the day-to-day Index related maintenance/calculations/publications; as described in Section 1
Base Currency	The Currency of the respective Index
Eligible Country Universe	A bond included in the Index
Index Component	A bond which is currently a member of the Index
Eligible Index Component	A bond not currently in the Index, but meets the eligibility criteria for possible inclusion
Amount Outstanding	The Amount outstanding of a bond, as defined by the Bloomberg field "AMT_OUTSTANDING"
Scheduled Determination Date	Five (5) Business Days prior to the last Business of: • For the corporate Index: May and November • For the Government Index: Each calendar month
Determination Date	The Business Day on which the Scheduled Determination Date actually occurs
Scheduled Rebalance Date	Last Business Day of: • For the corporate Index: May and November • For the Government Index: Each calendar month
Rebalance Date	The Business Day on which the Scheduled Rebalance Date actually occurs
Review Dates (1 & 2)	Please refer to PART VI Section 4
Accrued Interest	The interest accrued on a bond
Clean Price	The clean price of a bond
Dirty Price	Clean Price + Accrued Interest
Bid Price	The bid-price of a bond, as defined by the Bloomberg field: "PX_ASK"
Ask Price	The ask-price of a bond, as defined by the Bloomberg field: "PX_ASK"
Yield To Maturity	The yield to maturity of a bond, as defined by Bloomberg fields "YLD_YTM_MID"
Option Adjusted Spread	The Option Adjusted Spread of a bond, as defined by the Bloomberg field "OAS_SPREAD_MID"
Bond Maturity	The Maturity of a bond, as defined by the Bloomberg field "MATURITY"

References

Table 1 – Data Defintions And Access

Factor	Source	Detail /Data Link
For all of the realized data, we use the last available data point		
Public Debt to GDP Ratio	IMF	WEO Subject Code = GGXWDG_NGDP
GDP-PPP	IMF	"Gross domestic product based on purchasing-power-parity (PPP) valuation of country GDP". WEO Subject Code = PPPGDP
Fiscal Balance	IMF	WEO Subject Code = GGXCNL_NGDP
Net International Investment Position	IMF	Data comes from the IMF e-Library Dataset that can be accessed here: http://elibrary-data.imf.org/QueryBuilder.aspx?key=19784654&s=322 The data series that needs to be selected is from the "International Investment Position (BPM5)", then tick "IIP Net Assets,Total (BPM5)". This data should be taken in national currency and then divided by the corresponding GDP taken from the IMF World Economic Outlook (WEO Code: NGDP)
Current Account Balance	IMF	WEO Subject Code = BCA (units = US dollars) WEO Subject Code = BCA_NGDPD (units = % of GDP)
Misery Index	IMF	= sum of the Unemployment Rate and Inflation Rate
Inflation Rate	IMF	WEO Subject Code = PCPIPCH
Unemployment Rate	IMF	WEO Subject Code = LUR
Private Debt to GDP Ratio	World Bank	http://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS "Domestic credit to private sector (% of GDP)"
Political Stability	World Bank	Spreadsheet "Political StabilityNoViolence", column "Estimate" http://info.worldbank.org/governance/wgi/index.aspx#home
Old Age Dependency Ratio	United Nations	Old Age Dependency Ratio 4: http://esa.un.org/wpp/Excel-Data/population.htm
Market Rate	WMCO Reuters	WMCO Reuters 4pm fixing
PPP Implied Rate	IMF	"Implied PPP conversion rate". WEO Subject Code = WEO PPPEX.
Expected CPI	IMF	"Inflation, average consumer prices". WEO Subject Code = PCPIPCH. Data is taken for the same year as the rebalance date, as the current year will only be known for sure at the beginning of the next corresponding year.

Gross Added Value (GAV)[1]

- **U.S.:** Department of Statistics; Bureau of Economic Analysis: http://www.bea.gov/industry/index.htm
- **Euro:** Eurostat http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_nace64_c&lang=en
- **UK:** Office for National Statistics: http://www.ons.gov.uk/ons/datasets-and tables/index.html?pageSize=50&sortBy=none&sortDirection=none&newquery=bb_csdb_ds

1.Note: The GAV provided by each department above is mapped to a LOIM Sector by the LOIM Credit Research desk, where the sector definitions are provided in PART IV, Section 1.1.

Bloomberg Sector Mapping to LOIM Sectors

Sector Mapping Process: Bloomberg to LOIMS

BICS Level 1 Sector Name	BICS Level 2 Industry Group Name (To Include Sub- Categories Thereof)	LOIM Sector Name
Communications	Media	TMT-Transport
	Telecom	TMT-Transport
Consumer Discretionary	Apparel & Textile Products	Retail-Service
	Automotive	Autos-Aerospace
	Home & Office Products	Retail-Service
	Leisure Products	Retail-Service
	Commercial Services	Retail-Service
	Consumer Services	Retail-Service
	Gaming, Lodging & Restaurants	Retail-Service
	Passenger Transportation	TMT-Transport
	Recreation Facilities & Svcs	Retail-Service
	Distributors - Discretionary	Retail-Service
	Retail - Discretionary	Retail-Service
Consumer Staples	Consumer Products	Retail-Service
	Distributors - Consumer Staples	Retail-Service
	Retail - Consumer Staples	Retail-Service
Energy	Oil, Gas & Coal	Basic Industry
	Renewable Energy	Basic Industry
Financial	Banks	Bank
	Commercial Finance	Non-Bank Financial
	Consumer Finance	Non-Bank Financial
	Diversified Banks	Bank
	Financial Services	Bank
	Life Insurance	Non-Bank Financial
	Property & Casualty Insurance	Non-Bank Financial
Healthcare	Biotech & Pharma	Chemicals-Health
	Health Care Facilities & Svcs	Chemicals-Health
	Medical Equipment & Devices	Chemicals-Health
Industrials	Aerospace & Defense	Autos-Aerospace
	Electrical Equipment	Capital Goods
	Machinery	Capital Goods
	Manufactured Goods	Capital Goods
	Transportation Equipment	Autos-Aerospace
	Engineering & Construction Svcs	Capital Goods
	Industrial Services	Capital Goods
	Transportation & Logistics	TMT-Transport
	Waste & Environ Svcs & Equip	Capital Goods

Materials	Chemicals	Chemicals-Health
	Construction Materials	Capital Goods
	Forest & Paper Products	Basic Industry
	Iron & Steel	Basic Industry
	Metals & Mining	Basic Industry
Technology	Hardware	TMT-Transport
	Semi-conductors	TMT-Transport
	Software	TMT-Transport
	Technology Services	TMT-Transport
Utilities	Utilities	Utilities

Additional criteria

- In addition to the above table: If a financial issuer is classified as "Banks," 'Diversified Banks' or 'Financial Services' under the BICS Level 2 Industry Group then it is initially mapped into LOIM Banks Sector. However, if there are metrics missing for two or more of the FWD credit measures, then the issuer is then classified into LOIM Non-Bank Financial
- If there exists any Issuers which do not directly map from BICS to LOIM Sector the Index Oversight Committee reserves the right to reclassify individual Issuers as deemed appropriate

UCITS Guidance Note 1/96

The following clarifications are designed to assist a CIS in its assessment of whether a proposed stock exchange or market (the term "market" is used throughout this section) meets with the regulatory criteria

Interpretation of Criteria

Regulated

The market must be regulated. Such a market is subject to supervision by an authority or authorities, duly appointed or recognised by the state in which it is located. The authority(ies) should generally have the power to impose capital adequacy rules, to supervise directly members of the market, to impose listing standards, to ensure transparency in dealings and to impose penalties where breaches of rules or standards occur. The clearance and settlement system for transactions should also be regulated and should have acceptable settlement periods.

Recognised

The market must be recognised or registered by an authority or authorities, duly appointed or recognised by the state in which it is located. Investment in the market by locally based retail collective investment schemes should be permitted by the relevant authorities.

Operating Regularly

Trading must take place with reasonable frequency and the market should have regular trading hours. The assessment must have regard to liquidity in the market, including the number of members/participants, and the ability of the market to provide fair prices on an ongoing basis. Custody arrangements should also be satisfactory i.e., a trustee must be satisfied that it can provide for the safe-keeping of the assets of a CIS in accordance with the conditions set down by the Central Bank *(ref: UCITS 4, NU 7).*

Open to the public

The market must be open to the public. The public should have direct or indirect access to the securities traded on the market. The degree to which overseas investors are permitted to invest and any rules which may impede the repatriation of capital or profits must be taken into account.

Changes to the Index Methodology

[1] Change in Rebalance Frequency

8 January 2014 – Sovereign Bond Indices rebalance frequency changed to monthly (from semi-annually)

- Semi-annual rebalance: Index Inception Date to December 2014
- First monthly rebalance: last business day in January 2015

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Important information on benchmarks

Any benchmarks/indices cited herein are provided for information purposes only. No benchmark/index is directly comparable to the investment objectives, strategy or universe of a fund. The performance of a benchmark shall not be indicative of past or future performance of any fund. It should not be assumed that the relevant fund will invest in any specific securities that comprise any index, nor should it be understood to mean that there is a correlation between such fund's returns and any index returns.

The Fund's investments in Fixed Income securities are subject to the risks associated with debt securities including credit and interest rate risk. The fund may make substantial investments in derivatives which may involve a high degree of financial risk. These risks include the risk that a small movement in the price of the underlying security or benchmark may result in a disproportionately large movement, unfavourable or favourable in the price of the derivative instrument ; risks of default by a counterparty, and the risks that transactions may not be liquid.

Emerging markets securities may be less liquid and more volatile and are subject to a number of additional risks, including but not limited to currency fluctuations and political instability.