ActiveViam

Interpretation and Implementation of BCBS 457 - SBM CSR non-Sec

Atoti FRTB

6.0

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CSR non-Sec

This section describes how the CSR non-Sec risk-class is implemented and how the BCBS 457 specification is interpreted.

Also covered here is the specialization of the data, calculations, and configuration for the CSR non-Sec risk-class, including:

- The data model, which describes the data used for the calculations and how it is structured, and how the data model is represented in the:
  - input files
  - datastore
  - cube
- The calculations, both in the ETL and at query time
- The parameters used in the query time calculations
- How the Solution is configured for CSR non-Sec

Data Model (Core)

This section describes the data used for the CSR non-Sec calculations, including how the data is structured.

For CSR non-Sec, the **Curve** (Underlying) refers to the relevant issuer credit spread curves (bond and CDS) [MAR21.9](1).

Each of these curves has a **Curve Name**, **Bucket**, **Credit Quality**, **Sector**, and for covered bonds a **Covered Bond Rating**.

The **Risk Factor** is used to identify sensitivities. However, it is not used directly in the calculations, instead the **Curve**, **Curve Type**, and tenor fields are used (as appropriate for the risk-measure). This means that multiple **Risk Factor Names** may be used for the same risk-factor.

Additionally, for each **Bucket** a canonical **Credit Quality Category** and **Sector Category** are identified.

Sensitivities

Field	Key	Risk Measure	Description
As-of Date	Y	All	Timestamp (at close of business) for the data (T-1)
Trade ID	Y	All	A unique identifier for the trade (or position)
Risk Factor Name	Y	All	A unique identifier for the risk-factor

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Field	Key	Risk Measure	Description
Risk Class	Y	All	“CSR non-Sec”
Risk Measure	Y	All	“Delta”, “Vega”, or “Curvature”
Sensitivity Tenor	Y	Delta	The tenor in the credit spread curve
Option Maturity	Y	Vega	The maturity of the option
Sensitivity		Delta & Vega	The sensitivity value s_k
Shock Up/Down		Curvature	The up and down shocked prices.
Sensitivity Currency		All	Currency in which the sensitivity or shocked price is expressed.
Risk Weight		Curvature	Risk weight used for the shocked prices
PV Applied		Curvature	Has the PV been subtracted from the shocked prices?
Optionality		Delta	Should the Delta sensitivity be included in the Curvature Calculation?
Interpolated Sensitivities		Delta & Vega	Sensitivities interpolated to the prescribed vertices

Risk Factor [MAR10.9]

The **Risk Factor** is used to identify sensitivities. However, it is not used directly in the calculations, instead the **Curve**, **Curve Type**, and tenor fields are used (as appropriate for the risk-measure). This means that multiple **Risk Factor Names** may be used for the same risk-factor.

Field	Key	Risk Measure	Description
As-of Date	Y	All	Timestamp (at close of business) for the data (T-1)
Risk Factor Name	Y	All	A name for the risk-factor
Risk Class	Y	All	“CSR non-Sec”
Risk Measure	Y	All	“Delta”, “Vega”, or “Curvature”

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Field	Key	Risk Measure	Description
Sensitivity Tenor		Delta	The time to maturity of the traded instrument (Delta)
Option Maturity		Vega	The maturity of the option (Vega)
Curve Name (Underlying)		All	Name of the relevant issuer credit spread curve
Curve Type		Delta & Vega	“Bond” or “CDS” (Delta and Vega)

For Curvature, the risk-factor is the same as the underlying.

Curve

The **Curve** (Underlying) refers to the relevant credit issuer spread curves (bond and CDS) [MAR21.9](1).

Field	Key	Description
As-of Date	Y	Timestamp (at close of business) for the data (T-1)
Curve Name (Underlying)	Y	Name of the issuer credit spread curve
Risk Class	Y	“CSR non-Sec”
Bucket		1-18
Credit Quality		“IG”, “HY”, or “NR”
Sector		The relevant sector of the curve
Covered Bond Rating		“high” for AA- and above covered bonds.

Calculations

This section describes the data manipulation and calculations applied to the sensitivities from the input files.

First, the ETL (Extract, Transform, Load) layer will apply some transformations as the data is loaded from the input files into the datastore.

Once the data is loaded into the datastore, it is available in the cube. The sensitivities in the cube may be partially aggregated upon commit to the datastore for BITMAP and LEAF aggregate providers. The remainder of the sensitivity aggregation is performed by Atoti Server at query time.

Then, also at query time, the post-processors calculate the capital charge from the aggregated

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sensitivities.

ETL (Reference Implementation)

The ETL (Extract, Transform, Load) layer provided with Atoti FRTB, using the default file format, will perform the following transformations when data is loaded from the input files into the datastore.

Risk Factor Name

If the risk-factor name is not included in the input file (using the default file format), a name is generated as follows:

- Delta: Curve Name + Curve Type
- Vega: Curve Name + Curve Type
- Curvature: Curve Name

Normalisation

In the default file format, each row of the sensitivities' files contains the sensitivity as well as a description of the risk factor and curve. The data normalisation splits this information across three stores in the datastore, as described in the data model.

Vectorisation

For efficiency, Delta and Vega sensitivities are stored in vectors. The entries of the vectors represent the tenors/maturities of the risk factors.

In the default file format, we allow sensitivities to be provided as either single values or as vectors. During the ETL, sensitivities are grouped together into vectors.

Interpolation

For compatibility with risk engines, Delta and Vega sensitivities may be loaded for any tenor/maturity. During the ETL, these sensitivities are interpolated to match the tenors/maturities in the specification.

Query Time (Core)

For the CSR non-Sec risk class, there are three main chains of post-processor calculations: Delta, Vega, and Curvature.

Delta and Vega

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The calculation steps for Delta and Vega are the same:

1. The calculations start by applying currency conversion to the aggregated raw sensitivities from the cube to get the Sensitivities.
2. The risk-weights are applied to get the Weighted Sensitivities (per risk-factor).
3. The (rho) correlations are then used to calculate the Risk Position (per bucket).
4. The Risk Positions are combined across all buckets to calculate the Risk Charge.

In the bookmarks folder "ActiveViam FRTB" -> "Basel Framework" -> "SBM", there are bookmarks "CSR non-Sec Delta" and "CSR non-Sec Vega" which contain tabs that walk through these calculation steps and include the measures mentioned here.

Curvature

For Curvature, the calculation steps are:

1. Start with vectors of shocked prices indexed by risk-weight (per risk-factor).
2. The risk-weight then determines which Shock Up/Down Prices we want, subtracting the trade **PV** if necessary.
3. The delta sensitivities are filtered sensitivities from the Delta calculations, and aggregated per Curvature risk-factor.
4. These are then combined to calculate the CVR Up/Down (per risk-factor).
5. The Risk Position Up/Down are calculated per bucket.
6. The greater of the up and down risk-positions is identified by the Risk Position Scenario, and used for the Risk Position (per bucket).
7. The Risk Positions are combined across all buckets to calculate the Risk Charge.

The bookmark "ActiveViam FRTB" -> "Basel Framework" -> "SBM" -> "CSR non-Sec Curvature" contains tabs that walk through these calculation steps and includes the measures mentioned here.

Delta/Vega Sensitivities

The **Delta/Vega Sensitivities** measures are the s_k in [MAR21.4](1) and (2).

For each **Sensitivity Currency**, the **Interpolated Sensitivities** are converted to the reference currency using the IFxRates API (supplied by the reference implementation). After this currency conversion, the values are aggregated for each **Risk Factor**.

Delta Sensitivities Long/Short

The **Delta Sensitivities Long/Short** measures are the Positive or Negative **Delta Sensitivities**.

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The Positive or Negative determination is made at the **Curve Name**, **Curve Type** and **Tenor** levels.

Curvature Scenario Up/Down PV.CCY

The **Scenario Up/Down PV.CCY** measures are vectors of shocked prices indexed by risk weight.

For each **Sensitivity Currency**, the **Shock Up/Down** prices are converted to the display currency using the IFxRates API. After this currency conversion, the values are aggregated for each **Risk Factor**.

Delta/Vega/Curvature Risk Weight

The **Delta**/**Vega**/**Curvature** **Risk Weight** measures are RW_k in [MAR21.4](3) and $RW_k^{(Curvature)}$ in [MAR21.5](2)(e).

For Delta and Curvature, following [MAR21.53], the values are looked up based on the configuration for the **Risk Factor's Bucket**. For Covered Bonds (bucket 8), when **Covered Bond Rating** is "high" an alternative risk weight may be looked up instead.

For Vega, following [MAR21.92], the value is looked up based on the configuration for the **Risk Class** (and its liquidity horizon).

Delta/Vega Weighted Sensitivities

The **Delta**/**Vega** **Weighted Sensitivities** measures are WS_k in [MAR21.4](3).

For each **Risk Factor** k, the **Delta/Vega Sensitivities** measures are multiplied by the **Delta/Vega Risk Weight**.

Curvature Delta Sensitivities

The **Curvature Delta Sensitivities** measure is s_{ik} in [MAR21.5](2)(f).

For each Curvature **Risk Factor** k, it is all the **Delta Sensitivities** with the same **Curve Name** as the risk factor, filtered by **Optionality**.

Curvature Shock Up/Down Prices

The **Curvature shock-up**/**down** **prices** measures are $V_i\left(x_k^{RW^{(Curvature)}\pm}\right) - V_i\left(x_k\right)$ in [MAR21.5](2).

Using linear interpolation, the shocked prices corresponding to the **Curvature Risk Weight** are determined from the **Curvature Scenario UP/Down.CCY** vectors. And, if **PV Applied** is not true/yes, the trade **PV** is subtracted.

Curvature CVR Up/Down

The **Curvature CVR** **Up**/**Down** measures are $CVR_k^{\pm}$ in **[MAR21.5]**(2).

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The **Curvature Delta Sensitivities** are multiplied by the **Curvature Risk Weight** and subtracted from/added to the **Curvature Shocked Up/Down Prices** (respectively).

Delta/Vega Risk Position Double Sums

The **Delta**/**Vega** **Risk Position Double Sums** measures are the $\sum_k \sum_l WS_k \cdot WS_l$ intermediate values that were requested for the 2017 and 2018 QIS exercises.

Within each **Bucket** (except the "other" bucket), each pair of **Risk Factors**, is categorised according to:

- Delta
  - Same or different **Curve Name**
  - Same or different **Tenor**
  - Same or different **Curve Type**
- Vega
  - Same or different **Curve Name**
  - Same or different **Curve Type**
  - Combinations of **Option Maturities**

Within each category, the pairs of **Delta/Vega Weighted Sensitivities** are multiplied together and summed.

Implementation Note: This calculation has been optimized so that it is performed with $O(N)$ (linear) time complexity, where N is the number of **Risk Factors**.

Delta/Vega Risk Position Correlations

The **Delta**/**Vega** **Risk Position Correlation** measures are ρ_{kl} in [MAR21.4](4).

Within each **Bucket** (except the "other" bucket), and for each category of **Risk Factor** pairs (see Delta/Vega Risk Position Double Sums) the values are looked up from the configuration for [MAR21.54], [MAR21.55], and [MAR21.94].

Note: The $\rho_{kl}^{(Delta)}$ in [MAR21.94] does not include $\rho_{kl}^{(tenor)}$ in [MAR21.54](2) and [MAR21.55](2) as the Vega **Risk Factors** are not differentiated by the Delta **Sensitivity Tenor**.

Delta/Vega Risk Position

The **Delta**/**Vega** **Risk Position** measures are K_b in [MAR21.4](4).

For each **Bucket** (except the "other" bucket), the **Delta/Vega Risk Position** is calculated from the **Delta/Vega Weighted Sensitivities** and **Delta/Vega Risk Position Correlations** using the formula in [MAR21.4](4).

For the "other" bucket, the **Delta/Vega Risk Position** is calculated as the sum of the absolute values of the

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Delta/Vega Weighted Sensitivities (as per [MAR21.56]).

Implementation Note: This calculation has been optimized so that it is performed with $O(N)$ (linear) time complexity, where N is the number of **Risk Factors**.

Curvature Risk Position Up/Down

The **Curvature Risk Position Up/Down** measures are $K_b^{\pm}$ in [MAR21.5](3).

Within each **Bucket** (except the "other" bucket), the **Curvature CVR Up/Down** values are combined using the formula in [MAR21.5](3).

For the "other" bucket, the **Curvature Risk Position Up/Down** is calculated as the sum of the positive **CVR Up/Down** values.

Implementation Note: This calculation has been optimized so that it is performed with $O(N)$ (linear) time complexity, where N is the number of **Risk Factors**.

Curvature Risk Position Scenario

Within each **Bucket**, the **Curvature Risk Position Scenario** measure identifies which of the **Curvature Risk Position Up** and **Curvature Risk Position Down** values is the greater.

Curvature Risk Position

The **Curvature Risk Position** measure is K_b in [MAR21.5](3).

Within each **Bucket**, it is the greater of the **Curvature Risk Position Up** and **Curvature Risk Position Down** values.

Delta/Vega Risk Charge

The **Delta/Vega Risk Charge** measures are Delta and Vega in [MAR21.4](5).

They are calculated by combining the **Delta/Vega Risk Positions** (and aggregated **Delta/Vega Weighted Sensitivities**) over all **Buckets** according to [MAR21.4](5).

Curvature Risk Charge

The **Curvature Risk Charge** measure is $\mathrm{Curvature\ risk}$ in [MAR21.5](4).

It is calculated by combining the **Curvature Risk Positions** (and aggregated **CVR Up** or **CVR Down** values) over all **Buckets** according to [MAR21.5](4).

Input Files (Reference Implementation)

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This section describes how the input files containing the sensitivities and mappings are used for the CSR non-Sec risk class

The sensitivities are loaded from the Delta, Vega, Curvature, or CRIF sensitivity files.

The mapping of **Sector** and **Rating** to **Bucket** is loaded from the CSR non-Sec Buckets file. A description of these buckets is loaded from the CSR non-Sec Bucket Descriptions file.

SBM_Delta_Sensitivities*.csv

The Delta Sensitivity Data is loaded from the **Delta** files.

The following table lists the fields in the file format that is used for the CSR non-Sec risk-class. See the Delta file format documentation for details on the file format. See Data Model (Core) for a description of the data model.

Data Model Field	File Column	Notes
As-Of Date	AsOfDate	
Trade ID	TradeID	
Sensitivity Currency	DeltaCcy	
Sensitivities	DeltaSensitivities	May be single value or vector, with the same number of entries as Tenors
Risk Class	RiskClass	“CSR non-Sec”
Sensitivity Tenor	SensitivityDates	May be single value, vector, or empty; if empty, treated as the prescribed tenors: 0.5;1;3;5;10
Risk Factor Name	RiskFactor	(Optional) If not present, generated during ETL
Curve Type	RiskFactorType	“Bond” or “CDS”
Curve Name	Underlying	
Bucket	Bucket	1-18
Credit Quality	CSRQuality	
Sector	CSRSector	

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Data Model Field	File Column	Notes
Optionality	Optionality	Should this sensitivity be included in the Curvature calculations ('Y') or no ('N')
Covered Bond Rating	CSRRating	(Optional) For covered bonds, "high" for rating AA- or above; otherwise "low"

SBM_Vega_Sensitivities*.csv

The Vega Sensitivity Data is loaded from the **Vega** files.

The following table lists the fields in the file format that is used for the CSR non-Sec risk-class. See the Vega file format documentation for details on the file format. See Data Model (Core) for a description of the data model.

Data Model Field	File Column	Notes
As-Of Date	AsOfDate	
Trade ID	TradeID	
Risk Class	RiskClass	"CSR non-Sec"
Option Maturity	OptionMaturity	May be single value, vector, or empty; if empty, treated as the prescribed maturities: 0.5;1;3;5;10
Sensitivities	VegaSensitivities	May be single value or vector, with the same number of entries as maturities
Sensitivity Currency	VegaCcy	
Risk Factor Name	RiskFactor	(Optional) If not present, generated during ETL
Curve Type	RiskFactorType	"Bond" or "CDS"
Curve Name	Underlying	
Bucket	Bucket	1-18
Credit Quality	CSRQuality	

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Data Model Field	File Column	Notes
Sector	CSRSector	

SBM_Curvature_Sensitivities*.csv

The Curvature Sensitivity Data is loaded from the **Curvature** files.

The following table lists the fields in the file format that are used for the CSR non-Sec risk-class. See the Curvature file format documentation for details on the file format. See Data Model (Core) for a description of the data model.

Data Model Field	File Column	Notes
As-Of Date	AsOfDate	
Trade ID	TradeID	
Risk Class	RiskClass	“CSR non-Sec”
Risk Factor Name	RiskFactor	(Optional) If not present, generated during ETL
Shock Up	Shift_Up_PV	
Shock Down	Shift_Down_PV	
Sensitivity Currency	CurvatureCcy	
Risk Weight	RiskWeight	(Optional)
PV Applied	PV Applied	Has the Trade PV already been subtracted from the shocked PVs (‘Y’) or no (‘N’)
Curve Name	Underlying	
Credit Quality	CSRQuality	
Sector	CSRSector	
Bucket	Bucket	1-18

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Config Files

This section describes the reference implementation configuration used for the CSR non-Sec risk class

frtb-config.properties

Data Model Field	Property	Reference
As-Of Date	as-of-date.level	AsOfDate@Date@Dates
Trade ID	trade.level	TradeId@Trades@Booking
Risk Class	risk-class.level	RiskClass@Risk Classes@Risk
Risk Measure	risk-measure.level	Risk Measure@Risk Measures@Risk
Bucket	csr-ns.buckets.level	CSR non-Sec Bucket@CSR non-Sec Buckets@Buckets
Risk Factor Name	risk-factors.level	Risk Factor@Risk Factors@Risk
Sensitivity Tenor	vertices.level	Vertex@Vertices@Risk
Option Maturity	csr-ns.vega.option.maturity	Vertex@Vertices@Risk
Curve Name	csr.underlying.level	Underlying@Underlying@Market Data
Curve Type	csr.basis.level	Risk Factor Type@Risk Factor Types@Risk
Credit Quality	csr-ns.market-data.quality.level	CSR Quality@CSR Quality@Market Data
Sector	csr-ns.market-data.sector.level	CSR Sector@CSR Sector@Market Data

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Data Model Field	Property	Reference
Covered Bond Rating	csr-ns.market-data.rating.level	CSR Rating@CSR Rating@Market Data
PV Applied	csr-ns.pv.applied.level	PVApplied@PVApplied@Currencies
	csr-ns.delta.double-sums.levels	Name@CSR non-Sec Delta Double Sums@Double Sums, Tenor@CSR non-Sec Delta Double Sums@Double Sums, Basis@CSR non-Sec Delta Double Sums@Double Sums
	csr-ns.vega.double-sums.levels	Name@CSR non-Sec Vega Double Sums@Double Sums, Basis@CSR non-Sec Vega Double Sums@Double Sums, Maturity1@CSR non-Sec Vega Double Sums@Double Sums, Maturity2@CSR non-Sec Vega Double Sums@Double Sums

Datastore (Reference Implementation)

This section describes how the SA datastore schema is used for the CSR non-Sec risk class.

The schema starts with the SaSensitivities store, which is an index of all the facts in the SA Cube. The **SaSensitivities** store has references to the risk-factor descriptions and sensitivities.

Risk Factor Descriptions

The risk-factor description starts with the RiskFactorDescription store, which contains the description of risk-factor independent of the curve, and a reference to the UnderlyingDescription store for a description of the curve.

The **UnderlyingDescription** store references the CSRBucketDesc store for the bucket descriptions.

Sensitivities

The sensitivities stores contain the sensitivity values, they are referenced from the **SaSensitivities** store.

Risk Measure	Sensitivity Store
Delta	Delta

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Risk Measure	Sensitivity Store
Vega	Vega
Curvature	Curvature

SaSensitivities

The **SaSensitivities** store is the base store in the SA Cube Schema. Each row in this table represents a fact in the SA Cube.

The following table lists the fields in the store that are used for the CSR non-Sec risk-class. See the SaSensitivities store documentation for details on the store. See Data Model (Core) for a description of the data model.

Data Model Field	Store Field	Notes
As-Of Date	AsOfDate	
Trade ID	TradeId	
Risk Factor Name	Risk Factor	
Risk Class	RiskClass	"CSR non-Sec"
Risk Measure	Risk Measure	"Delta", "Vega", or "Curvature"

RiskFactorDescription

The RiskFactorDescription store contains the description of risk-factor.

The following table lists the fields in the store that are used for the CSR non-Sec risk-class. See the RiskFactorDescription store documentation for details on the store.

Data Model Field	Store Field	Notes
As-Of Date	AsOfDate	
Risk Factor Name	Risk Factor	
Risk Class	RiskClass	"CSR non-Sec"
Risk Measure	Risk Measure	"Delta", "Vega", or "Curvature"
Curve Name	Underlying	

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Data Model Field	Store Field	Notes
Curve Type	Risk Factor Type	“Bond” or “CDS”
Sensitivity Tenors	Maturity	for Vega only

UnderlyingDescription

The **UnderlyingDescription** store contains the description of the curve.

The following table lists the fields in the store that are used for the CSR non-Sec risk-class. See the UnderlyingDescription store documentation for details on the store.

Data Model Field	Store Field	Notes
As-Of Date	AsOfDate	
Curve Name	Underlying	
Risk Class	RiskClass	“CSR non-Sec”
Bucket	Bucket	
Credit Quality	CSRQuality	
Sector	CSRSector	
Covered Bond Rating	CSRRating	“high” or “low”

Delta

The **SaSensitivities** store contains the Delta sensitivities.

The following table lists the fields in the store that are used for the CSR non-Sec risk-class. See the SaSensitivities store documentation for details on the store.

Data Model Field	Store Field	Notes
As-Of Date	AsOfDate	
Trade ID	TradeId	
Risk Factor Name	Risk Factor	

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Data Model Field	Store Field	Notes
Risk Class	RiskClass	“CSR non-Sec”
Risk Measure	Risk Measure	“Delta”
Sensitivity Currency	Ccy	
Sensitivities	DeltaSensitivities	
Optionality	Optionality	‘Y’ or ‘N’

Vega

The **SaSensitivities** store contains the Vega sensitivities.

The following table lists the fields in the store that are used for the CSR non-Sec risk-class. See the SaSensitivities store documentation for details on the store.

Data Model Field	Store Field	Notes
As-Of Date	AsOfDate	
Trade ID	TradeId	
Risk Factor Name	Risk Factor	
Risk Class	RiskClass	“CSR non-Sec”
Risk Measure	Risk Measure	“Vega”
Sensitivity Currency	Ccy	
Sensitivities	VegaSensitivities	

Curvature

The **SaSensitivities** store contains the Curvature shocked prices.

The following table lists the fields in the store that are used for the CSR non-Sec risk-class. See the SaSensitivities store documentation for details on the store.

Data Model Field	Store Field	Notes
As-Of Date	AsOfDate	

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Data Model Field	Store Field	Notes
Trade ID	TradeId	
Risk Factor Name	Risk Factor	
Risk Class	RiskClass	"CSR non-Sec"
Risk Measure	Risk Measure	"Curvature"
Shock Up	Shift_Up_PV	Vector-valued. Same size as Risk Weight
Shock Down	Shift_Down_PV	Vector-valued. Same size as Risk Weight
Risk Weight	RiskWeight	(optional) Vector-valued
PV Applied	PVApplied	'Y' or 'N'
Sensitivity Currency	Ccy	

CSRNonSecBucket

The **CSRNonSecBucket** store is used by the ETL to populate the Bucket.

The following table lists the fields in the store that are used for the CSR non-Sec risk-class. See the CSRNonSecBucket store documentation for details on the store.

Data Model Field	Store Field	Notes
As-Of Date	AsOfDate	
Bucket	Bucket	1-18
Credit Quality Category	Rating Category	
Sector Category	Sector Category	
Risk Class	RiskClass	"CSR non-Sec"

CSRBucketDesc

The **CSRBucketDesc** store provides canonical descriptions for the CSR non-Sec buckets.

The following table lists the fields in the store that are used for the CSR non-Sec risk-class. See the CSRBucketDesc store documentation for details on the store.

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Data Model Field	Store Field	Notes
As-Of Date	AsOfDate	
Credit Quality	Credit Quality	Must match Credit Quality in UnderlyingDescription store
Sector	Sector	Must match Sector in UnderlyingDescription store
Bucket	Bucket	1-18
Risk Class	RiskClass	"CSR non-Sec"

Cube Schema (Reference Implementation)

The following table lists the levels and hierarchies in the Cube schema that are used in the CSR non-Sec data model.

Data Model Field	Cube Level/Hierarchy	Notes
As-Of Date	AsOfDate	Slicing Hierarchy
Trade ID	TradeId	
Risk Class	Risk Class	"CSR non-Sec"
Risk Measure	Risk Measure	"Delta", "Vega", "Curvature"
Bucket	CSR non-Sec Bucket	
Risk Factor Name	Risk Factor	
Sensitivity Tenor / Option Maturity	Vertex	Analysis Hierarchy
Curve Name	Underlying	
Curve Type	Risk Factor Type	
Credit Quality	CSR Quality	
Sector	CSR Sector	
Covered Bond Rating	CSR Rating	
	CSR non-Sec Delta Double Sums	Levels for the Delta Double Sums and Correlations

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Data Model Field	Cube Level/Hierarchy	Notes
	CSR non-Sec Vega Double Sums	Levels for the Vega Double Sums and Correlations

Configuration (Core)

This section describes how the calculations are configured for the CSR non-Sec risk class

Bucket Risk Weights

Maps Buckets to Risk Weights.

The file **CSR_BucketsRiskWeights_NONSEC*.csv** is loaded into the **CSRBucketsRiskWeight** store.

Data Model Field	File Column	Datastore Column	Notes
Bucket	Bucket	Bucket	1-18
RW_k in [MAR21.53]	Risk Weight	RiskWeight	
Risk Class		RiskClass	"CSR non-Sec"

Inter-Bucket Correlations

Maps Bucket x Bucket to $\gamma_{bc}^{(sector)}$ correlation.

The file **CSRNS_Bucket_Correlations*.csv** is loaded into the **CSRBucketCorrelations** store.

Data Model Field	File Column	Datastore Column	Notes
Bucket b	Bucket X	Bucket X	1-18
Bucket c	Bucket Y	Bucket Y	1-18
$\gamma_{bc}^{(sector)}$ in [MAR21.57]	Correlation	Correlation	
Risk Class		RiskClass	"CSR non-Sec"

Vertices

The list of CSR non-Sec Delta Tenors and Vega Option Maturities.

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The file **Vertices*.csv** is loaded into the **Vertices** store.

Data Model Field	File Column	Datastore Column	Notes
	Index	Index	0-4 The index within the vector. For example, if vertex "0.5" has index "0", then the first entry in the vector is the 0.5 vertex.
Sensitivity Tenor / Option Maturity	Vertex	Vertex	0.5;1;3;5;10 Delta Tenors in [MAR21.9](1)(b) Vega Option Maturities in [MAR21.9](2)
Risk Class	Risk Class	RiskClass	"CSR non-Sec"
Risk Measure	Risk Measure	Risk Measure	"Delta" or "Vega"

Vega Liquidity Horizons

The file **Vega_Liquidity_Horizons*.csv** is loaded into the **VegaRiskWeights** store.

Data Model Field	File Column	Datastore Column	Notes
Risk Class	Risk Class	RiskClass	"CSR non-Sec"
$LH_{\text{risk class}}$ in [MAR21.92]	Vega LH	Liquidity Horizon	"120"

Miscellaneous Parameters

The file **FRTBParameters*.csv** is loaded into the **FRTBParameters** store.

Parameter	Parameter Name	Default Value
$\rho_{kl}^{(name)}$ in [MAR21.54]	sa.csr-nonsec.delta.rho-name.correlation	0.35
$\rho_{kl}^{(tenor)}$ in [MAR21.54] and [MAR21.55]	sa.csr-nonsec.delta.rho-tenor.correlation	0.65
$\rho_{kl}^{(basis)}$ in [MAR21.54] and [MAR21.55]	sa.csr-nonsec.delta.rho-basis.correlation	0.999
$\rho_{kl}^{(name)}$ in [MAR21.55]	sa.csr-nonsec.delta.rho.index.correlation	0.8

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Parameter	Parameter Name	Default Value
Use alternative risk weight for highly rated covered bonds in [MAR21.53]	sa.csr-nonsec.delta.risk-weight.covered-bonds.use-high-rating-alternative	true
Alternative risk weight for highly rated covered bonds in [MAR21.53]	sa.csr-nonsec.delta.risk-weight.covered-bonds.high-rating-alternative	0.015
RW_σ in [MAR21.92]	sa.vega.rw	0.55
α in [MAR21.93](1)(a)	sa.vega.rho-option-maturity.alpha	0.01

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