ActiveViam

Interpretation and Implementation of BCBS 457 - SBM CSR Sec CTP

Atoti FRTB

6.0

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CSR Sec CTP

This section describes how the SBM CSR Sec CTP 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 Sec CTP 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 Sec CTP

Implementation Note

The data and calculations for the CSR Sec CTP risk class are specified in [MAR21.58]–[MAR21.61] in relation to their differences from CSR non-Sec.

In Atoti FRTB, these two risk classes share a lot of configuration and the CSR Sec CTP calculations will depend on the CSR non-Sec configuration. For example, the configuration for $\rho_{kl}^{(name)}$ and $\rho_{kl}^{(tenor)}$ are inherited from the CSR non-Sec risk class and not specified separately for CSR Sec CTP.

Data Model (Core)

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

For CSR Sec CTP, the **Underlying** refers to the underlying credit spread curves (bond and CDS) [MAR21.11](2).

Each of these underlyings has an **Underlying Name**, **Bucket**, **Credit Quality**, and **Sector**.

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

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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
Risk Class	Y	All	“CSR Sec CTP”
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

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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 Sec CTP”
Risk Measure	Y	All	“Delta”, “Vega”, or “Curvature”
Sensitivity Tenor		Delta	The time to maturity of the traded instrument
Option Maturity		Vega	The maturity of the option
Underlying Name		All	The name underlying the securitisation
Curve Type		Delta	“Bond” or “CDS”

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

Underlying

The **Underlying** refers to the underlying credit spread curves (bond and CDS) [MAR21.11](2).

Field	Key	Description
As-of Date	Y	Timestamp (at close of business) for the data (T-1)
Underlying Name	Y	Name of the underlying
Risk Class	Y	“CSR Sec CTP”
Bucket		1-16
Credit Quality		“IG”, “HY”, or “NR”
Sector		The relevant sector of the underlying

Calculations

This section describes ETL from the reference implementation and the transformations / calculations applied to the sensitivities in the post-processors after they have been aggregated.

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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 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: Underlying Name + Curve Type
- Vega: Underlying Name + Curve Type
- Curvature: Underlying 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 Underlying. 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)

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

Delta and Vega

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 Sec CTP Delta" and "CSR Sec CTP 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 Sec CTP 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

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values are aggregated for each **Risk Factor**.

Delta Sensitivities Long/Short

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

The Positive or Negative determination is made at the **Underlying 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 reference 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 [MAR21.59], the values are looked up based on the configuration for the **Risk Factor's Bucket**.

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 **Underlying 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

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trade **PV** is subtracted.

Curvature CVR Up/Down

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

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 **Underlying Name**
  - Same or different **Tenor**
  - Same or different **Curve Type**
- Vega
  - Same or different **Underlying 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], [MAR21.60], 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).

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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 **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 Curvature risk in [MAR21.5](4).

It is calculated by combining the **Curvature Risk Positions** (and aggregated **CVR Up** or **CVR Down** values)

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over all **Buckets** according to [MAR21.5](4).

Input Files (Reference Implementation)

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

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

The mapping of **Sector** and **Credit Quality** to **Bucket** is loaded from the CSR Sec CTP Buckets file into the into the CSRSecCTPBucket store. A description of these buckets is loaded from the CSR Sec CTP 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 Sec CTP 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 Sec CTP”
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”

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Data Model Field	File Column	Notes
Underlying Name	Underlying	
Bucket	Bucket	1-16
Credit Quality	CSRQuality	
Sector	CSRSector	
Optionality	Optionality	Should this sensitivity be included in the Curvature calculations ('Y') or not ('N')?

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 Sec CTP 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 Sec CTP"
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"

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Data Model Field	File Column	Notes
Underlying Name	Underlying	
Bucket	Bucket	1-16
Credit Quality	CSRQuality	
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 Sec CTP 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 Sec CTP”
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 not (‘N’)?

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Data Model Field	File Column	Notes
Underlying Name	Underlying	
Bucket	Bucket	1-16
Credit Quality	CSRQuality	
Sector	CSRSector	

Config Files

This section describes the reference implementation configuration used for the CSR Sec CTP 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-sec-ctp.buckets.level	CSR Sec CTP Bucket@CSR Sec CTP Buckets@Buckets
Risk Factor Name	risk-factors.level	Risk Factor@Risk Factors@Risk
Sensitivity Tenor	vertices.level	Vertex@Vertices@Risk
Option Maturity	csr-sec-ctp.vega.option.maturity	Vertex@Vertices@Risk

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Data Model Field	Property	Reference
Underlying Name	csr.underlying.level	Underlying@Underlying@Market Data
Curve Type	csr.basis.level	Risk Factor Type@Risk Factor Types@Risk
Credit Quality	csr-sec-ctp.market-data.quality.level	CSR Quality@CSR Quality@Market Data
Sector	csr-sec-ctp.market-data.sector.level	CSR Sector@CSR Sector@Market Data
PV Applied	csr-sec-ctp.pv.applied.level	PVApplied@PVApplied@Currencies
	csr-sec-ctp.delta.double-sums.levels	Name@CSR Sec CTP Delta Double Sums@Double Sums, Tenor@CSR Sec CTP Delta Double Sums@Double Sums, Basis@CSR Sec CTP Delta Double Sums@Double Sums
	csr-sec-ctp.vega.double-sums.levels	Name@CSR Sec CTP Vega Double Sums@Double Sums, Basis@CSR Sec CTP Vega Double Sums@Double Sums, Maturity1@CSR Sec CTP Vega Double Sums@Double Sums, Maturity2@CSR Sec CTP Vega Double Sums@Double Sums

Datastore (Reference Implementation)

This section describes how the SA datastore schema is used for the CSR Sec CTP 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 underlying, and a reference to the UnderlyingDescription store for a description of the underlying.

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

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Sensitivities

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

Risk Measure	Sensitivity Store
Delta	Delta
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 Sec CTP 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 Sec CTP”
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 Sec CTP risk-class. See the RiskFactorDescription 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
Risk Factor Name	Risk Factor	
Risk Class	RiskClass	“CSR Sec CTP”
Risk Measure	Risk Measure	“Delta”, “Vega”, or “Curvature”
Underlying Name	Underlying	
Curve Type	Risk Factor Type	“Bond” or “CDS”
Sensitivity Tenors	Maturity	for Vega only

UnderlyingDescription

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

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

Data Model Field	Store Field	Notes
As-Of Date	AsOfDate	
Underlying Name	Underlying	
Risk Class	RiskClass	“CSR Sec CTP”
Bucket	Bucket	
Credit Quality	CSRQuality	
Sector	CSRSector	

Delta

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

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

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Data Model Field	Store Field	Notes
As-Of Date	AsOfDate	
Trade ID	TradeId	
Risk Factor Name	Risk Factor	
Risk Class	RiskClass	"CSR Sec CTP"
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	

CSRSecCTPBucket

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

See the CSRSecCTPBucket store documentation for details on the store.

Data Model Field	Store Field	Notes
Bucket	Bucket	1-16
Credit Quality Category	Rating Category	
Sector Category	Sector Category	
Risk Class	RiskClass	"CSR Sec CTP"

CSRBucketDesc

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

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

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Data Model Field	Store Field	Notes
Credit Quality	Credit Quality	Must match Credit Quality in UnderlyingDescription store
Sector	Sector	Must match Sector in UnderlyingDescription store
Bucket	Bucket	1-16
Risk Class	RiskClass	“CSR Sec CTP”

Cube Schema (Reference Implementation)

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

Data Model Field	Cube Level	Notes
As-Of Date	AsOfDate	Slicing Hierarchy
Trade ID	TradeId	
Risk Class	Risk Class	“CSR Sec CTP”
Risk Measure	Risk Measure	“Delta”, “Vega”, “Curvature”
Bucket	CSR Sec CTP Bucket	
Risk Factor Name	Risk Factor	
Sensitivity Tenor / Option Maturity	Vertex	Analysis Hierarchy
Underlying Name	Underlying	
Curve Type	Risk Factor Type	
Credit Quality	CSR Quality	
Sector	CSR Sector	
Credit Quality Category	CSR Sec CTP Rating Category	

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Data Model Field	Cube Level	Notes
Sector Category	CSR Sec CTP Sector Category	
		Levels for the Delta Double Sums and Correlations
		Levels for the Vega Double Sums and Correlations

Configuration (Core)

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

Bucket Risk Weights

Maps Buckets to Risk Weights.

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

Data Model Field	File Column	Datastore Column	Notes
Bucket	Bucket	Bucket	1-16
RW_k in [MAR21.59]	Risk Weight	RiskWeight	
Risk Class		RiskClass	"CSR Sec CTP"

Inter-Bucket Correlations

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

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

Data Model Field	File Column	Datastore Column	Notes
Bucket b	Bucket X	Bucket X	1-16
Bucket c	Bucket Y	Bucket Y	1-16
$\gamma_{bc}^{(sector)}$ in [MAR21.57] (via [MAR21.61])	Correlation	Correlation	
Risk Class		RiskClass	"CSR Sec CTP"

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Vertices

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

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

Data Model Field	File Column	Datastore Column	Notes
	Index	Index	0-4
Sensitivity Tenor / Option Maturity	Vertex	Vertex	0.5;1;3;5;10 Delta Tenors in [MAR21.11](2)(b) Vega Option Maturities in [MAR21.11](3)
Risk Class	Risk Class	RiskClass	"CSR Sec CTP"
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 Sec CTP"
$LH_{\text{risk class}}$ 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] (via [MAR21.60])	sa.csr-nonsec.delta.rho-name.correlation	0.35
$\rho_{kl}^{(tenor)}$ in [MAR21.54] (via [MAR21.60])	sa.csr-nonsec.delta.rho-tenor.correlation	0.65
$\rho_{kl}^{(basis)}$ in [MAR21.60]	sa.csr-sec-ctp.delta.rho-basis.correlation	0.99

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Parameter	Parameter Name	Default Value
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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