ActiveViam

Interpretation and Implementation of BCBS 457 - DRC non-Sec

Atoti FRTB

6.0

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DRC non-Sec

This section describes how the DRC non-Sec risk-class is implemented and how the MAR standard is interpreted.

Also covered here is the specialization of the data, calculations, and configuration for the DRC 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, and cube.
- The calculations, both in the ETL and at query time
- The parameters used in the query time calculations

Interpretation Note

Zero Risk Weights

Both BCBS and CRR2 are ambiguous about whether risk weights and netting/offsetting are applied per instrument or per obligor. Additionally, there is currently no consensus on how to resolve this ambiguity.

In both cases the risk weight and netting are stated as being per obligor:

- In BCBS, the NetJTD is calculated per obligor MAR22.3 (2) and the risk weight is determined per NetJTD MAR22.24.
- In CRR2, this is stated directly in Article 325v (1) (d) and (f)

However, in the formula for DRC_b (MAR22.25 and Article 325y(4)), the risk weights and NetJTD are used at the instrument level. Additionally, in MAR 22.7 and Article 325y (2), some exposures may have zero risk weight.

It is unclear how to calculate DRC_b with this ambiguity.

Implementation

In Atoti FRTB, the exposures (risk-factors) can be flagged as "zero risk weight" (and this can be overridden per exposure and per jurisdiction). The parameter `sa.drc.use-zero-risk-weight` (`true` for CRR2; `false` for BCBS) indicates that exposures tagged as "zero risk weight" should be treated according to one of the following interpretations when calculating DRC_b:

Exclude Zero Risk-Weight Exposures

In this interpretation, the zero risk-weight exposures are excluded from both the HBR/WtS ratio and the DRC_b formulas.

This interpretation can be selected by setting the configuration property `sa.drc.zero-risk-weight-`

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`mode=ignore`

Apply the Offsetting Twice

In this interpretation, the zero and non-zero risk-weight exposures are treated as having the same obligor for offsetting when calculating the HBR/WtS ratio.

However, when calculating the DRC_b, the exposures with different risk weights are considered to have different obligors for the purposes of offsetting. Effectively the zero risk-weight exposures are omitted from the DRC_b formula (having been included previously in the HBR/WtS formula).

This interpretation can be selected by setting the configuration property `sa.drc.zero-risk-weight-mode=hbr` (default).

Weighted Average Risk-Weight

In this interpretation, the weighted average of the risk weights for the zero and non-zero risk-weight exposures is determined using the Gross JTD per exposure as the weighting. This weighted average is then used as the single risk weight for the obligor.

This interpretation can be selected by setting the configuration property `sa.drc.zero-risk-weight-mode=weighted`

Data Model (Core)

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

For DRC non-Sec, each **Obligor** (Underlying) has an **Obligor Name**, **Bucket**, **Rating**, an optional **Risk Weight**, and a **Fund Treatment**.

The **Risk Factor** is used (along with the trade ID and as-of date) to identify the **JTD Exposures**. However, this field is not used directly in the calculations, instead the **Obligor**, **Seniority**, **Maturity**, and **Zero Risk Weight** fields are used. This means that multiple **Risk Factor Names** may be used for the same risk-factor.

The Field Mappings table lists all the fields across the data model and where they appear in the input files, database, and cube.

JTD Exposure

The **JTD Exposure** captures the jump-to-default risk that may not be captured by credit spread shocks under the SBM. The DRC calculations start with the **Gross JTD** which can be provided directly or calculated using the **Market Value**, **Notional**, and LGD.

Field	Key	Description

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Field	Key	Description
As-of Date	Y	Timestamp (at close of business) for the data (T-1)
Trade ID	Y	A unique identifier for the trade (or position)
Risk Factor Name	Y	A unique identifier for the risk-factor
Risk Class	Y	“DRC non-Sec”
Risk Measure	Y	“DRC”
Instrument LGD Type		Instrument type for LGD: “equity”, “junior debt”, “senior debt”, or “covered bond”
Direction		Is the exposure “long” or “short”
Market Value		The bond-equivalent market value of the exposure
Notional		The bond-equivalent notional of the exposure
Gross JTD		The pre-calculated Gross JTD of the exposure
Adjustment		An adjustment that may be added to the Gross JTD

Risk Factor

The **Risk Factor** is used (along with the trade ID and as-of date) to identify the **JTD Exposures**.

However, this field is not used directly in the calculations, instead the **Obligor**, **Seniority**, and **Maturity** fields are used. This means that multiple **Risk Factor Names** may be used for the same risk-factor.

Field	Key	Description
As-of Date	Y	Timestamp (at close of business) for the data (T-1)
Risk Factor Name	Y	A name for the risk-factor
Risk Class	Y	“DRC non-Sec”
Risk Measure	Y	“DRC”
Obligor (Underlying)		Name of the obligor
Seniority		Seniority of the exposure to the obligor

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Field	Key	Description
Maturity		Maturity of the trade
Zero Risk Weight		Flag indicating if the exposure qualifies for a zero risk-weight

Obligor

The **Obligor** (Underlying) object describes the obligor.

Field	Key	Description
As-of Date	Y	Timestamp (at close of business) for the data (T-1)
Obligor (Underlying)	Y	Name of the obligor
Risk Class	Y	"DRC non-Sec"
Bucket		"Corporates", "Sovereigns", or "Local Governments/Municipalities"
Rating		Credit quality of the obligor
Risk Weight		Optional override of the obligor's risk-weight
DRC Fund Treatment		Flag indicating if the obligor can be included in offsetting or diversification with other exposures

Field Mappings

The following table lists the fields in the data model and how they are mapped to the input files, datastore schema, and cube levels.

Data Model	Input Files	Datastore	Cube Level	Notes
all.As-of Date	DRC Trade Level.AsOfDate	all.AsOfDate	AsOfDate	
JTD Exposure.Trade ID	DRC Trade Level.TradeId	DRCBase.TradeId	TradeId	

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Data Model	Input Files	Datastore	Cube Level	Notes
all.Risk Class	DRC Trade Level.RiskClass	DRCBase.RiskClass	Risk Class	"DRC non-Sec"
JTD Exposure.Risk Measure Risk Factor.Risk Measure			Risk Measure	"DRC"
JTD Exposure.Risk Factor Name Risk Factor.Risk Factor Name	DRC Trade Level.RiskFactor	DRCBase.Risk Factor	Risk Factor	
Obligor.Obligor Risk Factor.Obligor	DRC Trade Level.Underlying	Obligor.ObligorId	DRC Obligor	Also Underlying
Risk Factor.Seniority	DRC Trade Level.Seniority	RiskFactorDescription.Seniority	DRC Seniority	
Risk Factor.Maturity	DRC Trade Level.Maturity	RiskFactorDescription.Maturity	DRC Maturity	
Risk Factor.Zero Risk Weight	DRC Trade Level.Zero Risk-Weight	RiskFactorDescription.Zero Risk Weight	DRC Zero Risk Weight	
Obligor.Bucket	DRC Trade Level.ObligorCategory	Obligor.ObligorCategory	DRC non-Sec Bucket	"Corporates" "Sovereigns" "Local Governments/Muni
Obligor.Rating	DRC Trade Level.Rating	Obligor.Rating	DRC non-Sec Rating	
Obligor.Risk Weight	DRC Trade Level.Risk Weight	Obligor.RiskWeight		
Obligor.DRC Fund Treatment	DRC Trade Level.DRC Fund Treatment	Obligor.DRC Fund Treatment	DRC Fund Treatment	

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Data Model	Input Files	Datastore	Cube Level	Notes
JTD Exposure.Instrument LGD Type	DRC Trade Level.InstrumentType	DRCBase.InstrumentLGDType	DRC Instrument LGD Type	"equity" "junior debt" "senior debt" "covered bond"
JTD Exposure.Direction	DRC Trade Level.Direction	DRCBase.Direction	DRC Direction	"long" or "short"
JTD Exposure.Market Value	DRC Trade Level.MarketValue	DRCBase.PresentValue		
JTD Exposure.Notional	DRC Trade Level.Notional	DRCBase.Notional		
JTD Exposure.Gross JTD	DRC Trade Level.GrossJTD	DRCBase.GrossJTD		
JTD Exposure.Adjustment	DRC Trade Level.Adjustment	DRCBase.Adjustment		

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 Notional, Market Value, and JTD values in the cube may be partially aggregated upon commit to the datastore for BITMAP and LEAF aggregate providers. The remainder of the aggregation is performed by Atoti Server at query time.

Then, also at query time, the post-processors calculate the capital requirements from these aggregated values.

ETL (Reference Implementation)

The ETL (Extract, Transform, Load) layer provided with the 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

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If the risk-factor name is not included in the input file (using the default file format), a name is generated as Obligor Name + Seniority + Maturity.

Normalisation

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

Query Time (Core)

The calculation steps for DRC non-Sec are as follows:

1. The Gross JTD is either provided directly or calculated from the Notional, PV, and LGD.
2. The Gross JTD values are scaled according to the exposure's maturity to calculate the Scaled Gross JTD.
3. Offsetting is applied to calculate the long and short Net JTD for each obligor.
4. The long and short Net JTD values are combined to calculate the Hedge Benefit Ratio (HBR).
5. The risk-weights may be either looked up by rating or provided directly per obligor. These are applied to the Net JTDs to get the long and short Weighted Net JTD.
6. The long and short Weighted Net JTDs are combined with the HBR to calculate the Default Risk Charge.

In the bookmarks folder "ActiveViam FRTB" -> "Basel Framework" -> "SA DRC" the "SA DRC non-Sec" bookmark contains tabs that walk through these calculation steps and include the measures mentioned here.

Gross JTD

The **Gross JTD** measure is defined in [MAR22.9] - [MAR22.14].

It may either be defined directly in the input files or calculated from **Notional**, **Market Value**, and **LGD** values. If `sa.drc.adjustment.apply=true`, then an adjustment is added to the Gross JTD.

Whichever method is used, the values are first converted to the display currency using the IFxRates API (supplied by the reference implmentation). After this currency conversion, the values are aggregated for each **Risk Factor**.

If the configuration parameter `sa.drc.strict-long-short=true` is set, then the Gross JTD is floored/capped at 0 (according to the direction long/short) at the risk-factor level [MAR22.10].

Scaled Gross JTD

The **Scaled Gross JTD** measure is the **Gross JTD** scaled according to maturity.

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The maturity scaling has a ceiling of 1 (`sa.drc.maturity.max`) and a floor of 0.25 (`sa.drc.maturity.min`). If no maturity is provided, the scale factor is set to 0.25 (`sa.drc.maturity.default`).

This default value can be used for cash equity positions.

Net JTD

The **Net JTD** **Long**/**Short** measures are calculated from the **Scaled Gross JTD** (or **Gross JTD**) according to [MAR22.19].

For each obligor, the Scaled Gross JTD values are aggregated by seniority ranking, then the offsetting is applied to get the long and short Net JTD.

For example, with seniorities $Senior > Junior > Equity$, and aggregate scaled gross JTD values JTD_{Senior}, JTD_{Junior}, JTD_{Equity}, we have:

$$Net\ JTD_{Long} = \max(\max(\max(JTD_{Senior}, 0) + JTD_{Junior}, 0) + JTD_{Equity}, 0)$$

$$Net\ JTD_{Short} = \min(\min(\min(JTD_{Equity}, 0) + JTD_{Junior}, 0) + JTD_{Senior}, 0)$$

HBR

The **Hedge Benefit Ratio** (or "WtS Ratio") is calculated for each bucket according to [MAR22.23] from the net long and short JTD values.

Risk Weight

The **Risk Weights** are looked up by rating for each obligor. This can be overridden by providing the risk weight directly in the obligor description.

> **NOTE**
>
> There is currently no consensus on how to interpret the specification when we have multiple risk-weights for a single obligor. This is addressed on the *CRR2* page.

Weighted Net JTD

The **Weighted Net JTD** **Long**/**Short** measures are calculated by multiplying the **Net JTD Long/Short** by the **Risk Weight**.

Default Risk Charge

The **Default Risk Charge** is calculated according to [MAR22.25] and [MAR22.26] from the **Weighted Net JTD Long/Short** and **HBR** measures.

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It is first calculated independently for each bucket, then summed over the buckets.

For obligors who have been flagged as high yield and distressed funds, the Default Risk Charge is calculated for those funds on a standalone basis before being included in the sum over the buckets.

Configuration (Core)

This section describes how the calculations are configured for DRC non-Sec.

DRC Seniority

Specifies a rank for each seniority, which is used to determine the relative seniority for the Net JTD offsetting.

The DRC Seniority Description file is loaded into the DRCWeight store.

Data Model Field	File Column	Datastore Column
Seniority	Seniority	Seniority
	Ranking	Ranking

Rating Risk Weights

The Rating Risk Weights are used to look up the risk-weight for obligors based on their rating.

The Default_Risk_Weights file is loaded into the DRCWeight store.

Data Model Field	File Column	Datastore Column
Rating	Rating	Rating
Default risk weight in [MAR22.24]	Default risk weight	DefaultRiskWeight
Start Date	Date	AsOfDate
Parameter Set	ParameterSet	ParameterSet

Miscellaneous Parameters

The FRTBParameters file is loaded into the FRTBParameters store.

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Parameter	Parameter Name	BCBS Value	CRR2 Value
Default maturity scaling when no maturity is provided	`sa.drc.maturity.default`	0.25	
Floor for maturity scaling	`sa.drc.maturity.min`	0.25	
Ceiling for maturity scaling	`sa.drc.maturity.max`	1	
Add adjustments to Gross JTD	`sa.drc.adjustment.apply`	false	true
Use zero risk weight for some exposures	`sa.drc.use-zero-risk-weight`	false	true

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