MODEL THEORY

GLOBAL

MR: Market Risk
AV: Additional Value Adjustment Models
XXXX: **Concentrated positions**
TD: Model Theory, Design and Development

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1 INTRODUCTION

The objective of this document is to present the calculation methodology of Additional Valuation Adjustments for the concepts of Concentration related to the concentration of the portfolio positions (Concentrated Positions) on those instruments and positions valuated at fair value in order to obtain a prudent valuation.

The present AVA model has been developed in accordance with the Methodological Standards defined in the Bank for this type of models (see AVA Standards *[2]*). In particular, the Standard 2 states that the models must be compliance with regulatory requirements; applying in this case: IFRS13 *[3]*, CRR *[4]* and EBA RTS *[5]*.

This document contains the model theory, design and development of a list of adjustments that must be considered to price the portfolios at fair or at prudent value. In particular, the adjustments considered in this document are related with Concentrated Positions. The model is global and although some details of the implementation might be local, the theory and general definition of the model is common for all the group.

1.1 Context

The EBA considers a position to be concentrated when the aggregated position held by the bank is larger than "*normal traded volume or larger than the position sizes on which observable quotes or trades that are used to calibrate the price or inputs used by the valuation model are based*".

When the institution identifies the Concentrated Positions, a prudent exit period must be determined. For those instruments which the prudent exit period exceeds a 10-day time window, an AVA adjustment taking into consideration the volatility of the subjacent, the volatility of the bid-ask spread and the impact of the chosen hypothetical exit strategy on the market price.

Depending on the maturity of the particular market and the liquidity of the underlying, it will be possible to observe prices for more or less instruments in order to infer these market data and also to hedge the risk associated to them. The calibration of these market data is carried out internally and its accuracy is actively monitored by trading and IPV teams as any deviation would result in internal prices of products that would be out of the market. The volume of Santander trading activity, the contribution to consensus prices and the IPV activity are expected to guarantee the quality of the market data used as input for the pricing models.

The IFRS13 *[3]*, defines the concept of "fair price", essentially as an "exit price". This means that the P&L of the portfolios must be calculated including the necessary adjustments. In order to include this kind of effects, the possible uncertainty derived from the different prices used in the mentioned calibration process, together with the bid-ask of those prices must be taken into account.

Moreover, the CRR *[4]* and EBA RTS *[5]* collect the concept of "prudent value" which state that in terms of capital requirements, the portfolios must be valued including the necessary adjustments (Additional Value Adjustments - AVAs) to take into account for instance the market uncertainty, specific model risk, etc., under a prudent principle, generally linked to a 90% level of certainty.

The present AVA model has been developed in accordance with the Methodological Standards defined in the Bank for this type of models (see AVA Standards *[2]*) and in accordance with the mentioned regulation (IFRS13 about fair value, CRR and EBA RTS about prudent value). Actually, this way the model follows *Standard 2* that states that the models must be compliance with regulatory requirements.

1.2 Prudent Value and Additional Valuation Adjustments (AVAs)

The article 105 of the Capital Requirements Regulation (CRR) No 515/2013 of 26th October 2015 *[4]* imposes the principle of prudence in the pricing of financial instruments measured at fair value regardless of whether they are held in the trading book or in the banking book. In particular, the prudent value of an asset measured at fair value is obtained by including in the valuation a number of uncertainty factors that have not been included in their book value.

AVAs are calculated as the difference between the prudent value and the fair value of positions measured at fair value. The aggregation of AVAs should be deducted from the Common Equity Tier 1 Capital (CET1).

Therefore, institutions should calculate the necessary adjustments to obtain the prudent value and comply with the CRR requirements. According to Commission Delegated Regulation (EU) 2016/101, supplementing Regulation (EU) No 575/2013 with regard to regulatory technical standards for prudent valuation under Article 105 *[4]*, the prudent value of a position is linked to a range of plausible values and a specified target level of certainty (90%).

1.3 Definitions

- *Expected Value* – Average value in a range of possible values usually related to the one that measure a cumulative probability of 50% in a range of possible values.
- *Fair Value* - The price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date (i.e. an exit price).
- *Prudent Value* – The value at which an entity obtains an appropriate degree of certainty that it can exit a position. The regulation sets that degree of confidence at 90%.
- *Santander Price* – Price or input used by Santander to mark the positions (data normally stored in Asset Control system)
- *Valuation positions* – a financial instrument or commodity or portfolio of financial instruments or commodities held in both trading and non-trading books, which are measured at fair value.
- *Valuation exposure* – the amount of a valuation position which is sensitive to the movement in a valuation input.
- *Valuation input* – market observable or non-observable parameter or matrix of parameters that influences the fair value of a valuation position.

1.4 Model Demographics

The table below shows the main participants in the global model workflow. Information about the participants in local implementations can be found in the corresponding Model Implementation documents.

Role	Position	Name	Email	Area
Corporate Model Owner	Risk Division Director, Market Risk	Juan Andrés Muñoz Miguelañez	juamunoz@gruposantander.com	Corporate Market Risk Control
Local Model Owner	SCIB Market Risk Control Director	Álvaro Arévalo	alarevalo@gruposantander.com	SCIB Market Risk Control
Model User	SCIB Market Risk Control Director	Álvaro Arévalo	alarevalo@gruposantander.com	SCIB Market Risk Control

Model User	SCIB Market Risk Control Expert	Sergio Casín	secasin@gruposantander.com	SCIB Market Risk Control
Model implementation	Methodology Market Risk responsible	Pablo Blanco	pabblanco@gruposantander.com	Met Market Risk Area
Model implementation	Methodology Market Risk Expert	Ignacio Hoyos	ihoyos@gruposantander.com	Met Market Risk Area
Model developer	Methodology Market Risk responsible	Pablo Blanco	pabblanco@gruposantander.com	Met Market Risk Area
Model developer	Methodology Market Risk Expert	Ignacio Hoyos	ihoyos@gruposantander.com	Met Market Risk Area
Model validation	Risk Division Manager, Risk Validation	Elena López Dehesa	elenalopezd@gruposantander.com	Internal Validation

2 EXECUTIVE SUMMARY

Current document describes the model (or models) proposed to carry out the calculation of AVA adjustments for the concepts of Concentration related to the concentration of the portfolio positions (Concentrated Positions). This executive summary includes a brief description of the main aspects related to the concepts of the model. The implementation details are treated in its own document.

The concepts and solutions of the model for concentrated positions have a global or general scope, but it may be the case that certain local specificities have to be developed in the applicable local implementations.

For recognizing each “concentrated position” within the portfolio, each unit should refer to the corporate methodological procedure for identifying those positions subject to an adjustment. The adjustment takes into account the liquidity of the market, the capacity of the institution to operate in it and the average daily market volume and the typical daily trading volume of the entity.

For each “concentrated position” for which there is no available market price due to the size of the position, a prudent exit period is determined, and an AVA in calculated taking into account the volatility of the price, the volatility of the bid/offer spread, and the hypothetical exit strategy.

The AVA of each individual concentrated position is calculated by considering the following factors:

- Volatility of the valuation input.
- Volatility of the bid-offer spread.
- Impact of the exit strategy on the market price.

With the goal of covering all the financial instruments casuistry, the market data availability and the systems’ performance, two different methodologies are proposed for the calculation of the valuation adjustment.

The first method is the model impact calculation, which is principally applicable to securities in which the most relevant factor is the impact on the market by the exit strategy. Moreover, when modelling underlyings evolution prices along the holding period, a prudent volatility will be taken.

Additionally, the alternative method is the so-called add-on method, that is applicable to the general case, to which multipliers in function of position size / market volume ratio will be defined. This method is particularly suitable for illiquid or low liquidity assets with few market references when it is necessary to apply an expert judgment.

In terms of inputs, on one hand, the quality of the traded volume data used for the calculation of the concentration AVA has been improved. Additional market sources have been incorporated, such as executable quotes or data from Bloomberg or Markit for providing the traded volume, or internal data from Asset Control (AC) for generating the proxies.

On the other hand, certain products (e.g., bonds) do not have any reference traded volume (or executable quotes), so the consideration of a proxy is required. In this regard, a new definition of the proxy has been developed in order to make it more granular without losing robustness, due to the use of a broader population of reference instruments.

A significant effort has been performed in order to improve the estimation of the market access parameter, which has been estimated through objective data and the procedure to review it periodically has been defined.

All calculations have been tested through the development of a prototype in Python in order to reduce operational risk and preparing the future implementation in corporate systems.

3 PURPOSE, JUSTIFICATION AND BACKGROUND

This section deepens into the ideas mentioned in 1.1 about the nature of Concentrated Positions, the need of adjustments to be compliance with the regulation and the improvements intended to be achieved with this model compared with previous ones.

3.1 Purpose

The purpose of AVAs is to deduct in regulatory capital (CET1) any differences between fair values (recorded in accounting) and prudent valuations in fair valued financial positions.

For the aforementioned adjustments, the Prudent Value for the purpose of the AVAs is set by the regulation (see Art. 9.5 (a), Art. 10.6 (a) and Art. 11.3 of *[5]*) at a 90% confidence level, this is, the point within the range of plausible values where the entity is confident that can exit the position.

The concentration adjustment collects the potential impact caused by the bank in the market when closing a large position. This is, when a large amount of notional is sold or bought, if the market cannot absorb the whole of it, the exit price could be severely modified, impacting on the entity P&L. IFRS 13 does not allow for concentration fair value adjustments, since positions has to be measured individually and explicitly does not permit valuation adjustments to Level 1 inputs. As stated in *[3]* (par. 80), "*If an entity holds a position in a single asset or liability […] traded in an active market, the fair value of the asset or liability shall be measured within Level 1 […]. That is the case even if a market's normal daily trading volume is not sufficient to absorb the quantity held and placing orders to sell the position in a single transaction might affect the quoted price.*"

3.2 Justification

The Group, in compliance with AVA methodological standards 13 and 18 (*[2]*), has defined in the corporate procedures for AVAs *[7]* the need to consider the respective valuation adjustments for all risk factors where a Unit has positions. In this regard, there are different type of instruments measured at fair value that are subject to having an AVA adjustment due to concentration. This adjustment, calculated after the hypothetical impossibility of closing or hedging a position in a certain time window without affecting the market price, would only be reflected as an AVA, and no pricing adjustment (FVA) would be included.

As it has been previously stated, the scope is global, and it intends to be applicable to all Santander Units with a non-negligible exposure to this risk factor. This is compliance with AVAs Standard 5: Consistency across the Group (see *[2]*), which states that valuation adjustments *"to a valuation position shall follow the same methodology regardless the entity of Santander Group"*.

3.3 Background

Concentration AVA methodology presented in this document, (together with all the new FVA/AVA models that are being developed within MRAP project), aims to solve several recommendations about the former models, raised by Internal Audit Team (IVT), Internal Audit (IA) and ECB (during Model Risk OSI and Fair Value OSI), related to AVAs and FVAs alignment, consistency and governance and the lack of automation and integration in corporate systems.

Concentrated Positions methodology presented in this document tries to overcome all the mentioned weaknesses and, at the same time, tries to be aligned with the way in which Front Office manages the risk of the portfolio ("*business sense*" mentioned in FVA Standard 9 and 25). This review has been performed within a wider project of improving the methodology and automatize the FVAs and AVAs calculation in official systems during the period 2019-22.

Thus, the new model implicitly follows AVAs Standard 4: "*Follow-up recommendations*". The main goals are:

- Ensure that the new methodology is compliant with regulation and methodological standards (see AVA Standard 2: "*Compliance with regulatory requirements*" (see [2])).

- Include improvements in the calculation of the adjustments and the construction of the proxies required when there is no market data available.

- Automate the calculations: the new methodology is coded in Python as a previous step of the final implementation in corporate systems[1].

- Enhance model documentation in compliance with AVA Standard 51 "*Methodological documentation: models must be properly documented following the Golden Standards defined by Internal Validation*" and to meet the requirements issued by Model Risk in this sense (see reference *[8]*). Particular attention has been paid to evidence that current methodology and documentation is aligned with the Methodological Standard for AVAs.

- Justify and support the input data used to define the parameters entering the model, by providing quantitative evidence.

[1] The first implementation of the model described here is a prototype in Python that runs locally with data feeding from Excel spreadsheets. In the future, the code is expected to run inside the data lake Supra, reading the nominal position directly from trade details, importing market data (currently obtained from Asset Control) through an API to ACX and ingesting files to complete all the necessary inputs.

4 MODEL OVERVIEW

Although the core of the model will be treated later, for a better understanding of the model inputs and outputs, and the products that are within the scope of this AVA, it is interesting to outline a few ideas first.

According to the EBA RTS *[5]*, Article 14, paragraph 1, the process to be applied respect to concentrated valuation positions has three steps:

a) Identify the concentrated positions.

b) Where a market price applicable for the size of the valuation position is unavailable, a prudent exit period must be estimated.

c) Only where the prudent exit period exceeds 10 days, an AVA must be applied considering the volatility of the valuation input, the volatility of the bid-offer spread and the impact of the hypothetical exit strategy on market prices.

Regarding the identification of the concentrated positions, each unit should refer to the corporate procedure for identifying concentrated positions. Within these, the standards for determining the positions subject to the adjustment is detailed, and each unit is responsible for guaranteeing that the scope is properly covered. Any deviation from these standards should be duly justified.

For determining which positions are concentrated, paragraph 2 of the mentioned Article 14 of EBA RTS defines that the following aspects should be considered:

- The volume of the valuation positions relative to the liquidity of the related market.
- The institution’s market access.
- The average daily traded volume of the portfolio positions, and typical daily traded volume of the institution.

Joining all that information, we can conclude that in terms of AVAs, EBA considers that a position is concentrated if an estimated prudent exit period exceeds 10 days and in that case an AVA must be calculated. There are two aspects to solve:

1) The exit period estimation, which should consider aspects as: the size of the position, the institution’s market access, the average daily traded volume and the typical daily traded volume of the institution.
2) Calculate an AVA for the concentrated positions considering the aspects mentioned in c).

The methodological approach proposed in this document adds consistency to the AVA adjustments calculation. Additionally, it pretends to solve: Internal Validation Team (IVT) and Internal Audit (IA) recommendations, regarding the need for automation and deficiencies in documentation (justification of assumptions, alignment with corporate practices…); concerns raised by the ECB about consistency and governance.

As stated above, two different methodologies are proposed for the calculation of the valuation adjustment. The first method is the model impact calculation, which is principally applicable to securities in which the most relevant factor is the impact on the market by the exit strategy. On the other hand, the alternative method is the add-on method, that is applicable to the general case, to which multipliers in function of position size / market volume ratio will be defined. This method is particularly suitable for illiquid or low liquidity assets with few market references when it is necessary to apply an expert judgment.

Calculations have been automated (coded in Python) in order to reduce operational risk. While the Python algorithm executes the calculations in an automated way, a further degree of robustness is expected in the future implementation of the calculation engine.

An upgrade in model documentation has taken place in order to improve the justification of main assumptions and to probe the alignment with corporate standards and the regulation *[1][2][6]*.

The present version of the model is a review from the former model in production that has been performed within a wider project which objective is to improve the methodology and automatize the AVAs calculation in official systems during the period 2019-22.

In this regard, the following products and entities are within the scope of this AVA:

- Product types: all fair-valued assets, such as equity or credit instruments included in the banking book for which a change in accounting valuation has a partial or zero impact on CET1 capital. The last ones are in scope for assessing whether a concentrated position is held. It will only make the assessment on executed transactions (whenever they are given in repo or not), while temporary assets acquisitions will not be considered.

  Since Grupo Santander operates in completely liquid and deep derivative markets, these products fall outside the concentrated positions environment. However, each unit is responsible for the identification of derivative operating in limited markets (operational limitations) and for including it, if necessary, in the concentrated position analysis.

  Trading operating falls outside the concentrated positions analysis. This is because by their nature trading positions can be easily close, or in any event within 10 days. If there is a position which cannot be closed in 10 days, it must be calculated a concentration AVA for this position. In any case, it will be necessary to document all the trading positions.

- Entities: all entities with relevant ALCO portfolios or Trading activities are into the scope. At least: Spain, UK, USA, Portugal, Brazil, Mexico and Chile.

5 MODEL DATA

This section contains the information related to the possible data that can be used to build the inputs of the model. This means that the inputs are not always available directly and different tools or approaches should be applied to generate the inputs finally used by the AVA calculators. Also, the outputs given by the model are summarized here.

5.1 Model Inputs

The model inputs involved in the calculation of the Concentration AVA for Concentrated Positions are the following:

- Positions - Notional of the portfolio data at the greatest granularity level as of analysis date (risk metric) and accounting treatment of each portfolio.
- Market data - instrument prices, historical observed volume, volatility and market access percentage.
- Static data - Details of each underlying at the position granularity level (ISIN, underlying-tenor, etc.)

The following paragraphs describe details and evidence from the analysis of model inputs used for the calculation of the concentration adjustment. It is to highlight how the concentrated positions methodology has a dependency with different calculators (such as the Bonds and ABS FVA/AVA methodologies), and inputs from these could be required to be provided in order to ensure a correct execution of the process.

5.1.1 Positions

All fair-valued assets, such as equity or fixed income included in the banking book for which a change in accounting valuation has a partial or zero impact on CET1 capital, are in scope for assessing whether a Concentrated Position is held. It will only make the assessment on executed transactions (whenever they are given in repo or not), temporary assets acquisitions will not be taken into account.

The positions subject to the concentration adjustment should be aligned with the standards presented in the corporation procedure for identifying the concentrated positions (*[18]*). For this identification, the units may evaluate the positions subject to the adjustment through a qualitative or quantitative approach, both described within the referred documentation.

Nominal amounts, in the issuance currency, are obtained from Supra Datalake (in “Trade Details” tables, fed directly from Murex) at trade level. Thus, an aggregation process is followed (netting long and short positions on the same instrument) as the calculation of the AVA is performed at position level.

Besides the positions subject to a concentration adjustment, an additional, greater pool of instruments should be provided. This data will be used to generate the proxy, and every input described below should be given for not only the portfolio subject to the adjustment, but also to an additional greater pool of observations which will be used to generate the proxy. For more information regarding the proxy, please refer to section 6.1.2.2.

5.1.2 Market data

As it has been stated in subsection above, the following data should be provided aiming to cover both, the portfolio instruments, as well as the greater pool of observations used for the proxy generation.

The main inputs used in the model are the average daily traded volume, the volatility and the market access percentage.

Average daily traded volume

Determines the capacity of the market to trade a given security. This information may be retrieved from different sources. These sources should guarantee to be representative of the local portfolio, and should cover the greatest number of securities within scope possible. It should also consider data for additional securities in case proxies are required, as to fill the information of the proxy buckets (refer to 6.1.2.2 for a greater detail on the defined proxy).

As of model definition date, this information has been provided by the local IPV team. Traded volume data is obtained monthly for each bond and the average is calculated using a one-year temporal window.

Volatility

The data capture consists of retrieving from AC historical series of prices, calculate the returns and the standard deviations of the returns with a time-depth of one year. Data with unavailable information will be proxied.

Market access percentage

These percentages should be deducted from the historical observed activity, subject to the source from which the *average daily traded volume* data is extracted from. This is, of all the traded volume of the instruments subject to having an AVA adjustment per concentration, how much of it can Santander have access to when closing or hedging a position.

Depending on the available data, the market access percentage could be calculated differently. For instance,

- If there is available information at ISIN level, an average traded volume at ISIN level could be calculated

- Else, if the traded volume for every security within a sector is available, for each one an average traded volume is to be estimated, and then applied to every ISIN within the sector. In this case, the calculated average traded volume should be corrected by the number of traded ISIN within the market for a best approximation of the market access (refer to 6.1.2.1 for a greater detail on the proposed formula).

Comentado [DC1]: Iñaki,esto es lo que hemos comentado hoy sobre qué hacen las unidades para calcular el % de acceso al mercado para CoPo. En resumen, MX y BRA realizan un cálculo a nivel ISIN, y CHI y Boadilla por sector.

5.1.3 Static data

In addition to the market data, it is necessary to obtain static data at the greatest granularity level that enable to stablish buckets or categories of Concentrated Positions with similar characteristics. This static data is usually extracted from Asset Control (AC) and additional market data provider sources. To name some, Bloomberg or Reuters might be used to fill the missing information if not available. As proxies will be defined according to those categories, they should be granular enough to identify specific but homogeneous behaviors.

Along these lines, for the whole portfolio of instruments available in AC or Bloomberg, the following information might be considered depending on the asset class or risk factor. Particularly, for bonds the following are considered: country, market sector, currency, industry group, region, maturity and rating.

5.1.4 Manual inputs

In addition, the inputs mentioned above, there is the option to modify certain data that has been uploaded automatically or to even include additional instruments in the scope of concentration calculation subject to manual insertion. This would allow to calculate a CoPo adjustment to other instruments which may be subject to a CoPo AVA adjustment as defined in the corporative guidelines (*[2]*).

When inserting a new position in a certain underlying/instrument is included in the scope, these positions will be added to the portfolio subject to the adjustment. Note how, in this case a combination of fields is required as a minimum to be able to perform the calculation: the ISIN code, traded volume, market percentage, notional, currency, volatility and reference price should be provided to include a new instrument in the calculation. More details of this process in the Model Implementation document.

When inserting an underlying/instrument already contained in the scope, the data inserted will overwrite the data that was automatically uploaded, and the new data will be used to perform the adjustment calculation.

Note that only bonds and ABS will be included automatically. The rest of instruments should be included manually using the *inputs_adjustment.xlsx* file.

5.2 Model Outputs

The final outputs of the model are the figures of AVA for concentrated positions at the provided granularity level (they can be later aggregated at portfolio level or similar). Besides these main outputs, information related to the process followed to calculate the final figures is also shown (e.g. the average daily calculated traded volume and its inputs, calculated daily volatility…). All this information enables traceability, studying possible discrepancies with respect to the previous exercises, verifications of the figures or consulting any intermediate result of the model. The outputs can be grouped as concentration AVA input, buckets and proxy data, input proxy data, portfolio classification data, and intermediate calculations.

According to the regulation, the AVA will be the adjustment to move from the *fair value* to the *prudent value*. Also, the EBA RTS *[5]* states that "*under the core approach, the aggregation of individual AVAs related to market price uncertainty, model risk and close-out costs is determined separately for each category as either an aggregate AVA that is 50% of the sum of individual AVAs*" (this idea is also collected in AVA 12 about the AVAs aggregation).

In order to avoid recalculations, the model shows the AVA figures as if no FVA would be applied and without applying the 50% reduction. Thus, it can be called a "gross AVA". If the risk unit effectively apply the FVA suggested by the model, that value should be deducted from the AVA figure. Also, if the risk unit considers that the conditions to apply the 50% reductions are met, that reduction should be applied after deducting the FVA applied.

Additional Valuation Adjustments (AVAs) are calculated quarterly. The AVAs results are reported to Corporation and consolidated into COREPs reports.

Regarding model use, the model has been developed in the context of Santander Group and the appropriateness of the assumptions, proxies and numbers have been verified within that context.

Some of the assumptions might need to be specifically revisited locally when the use of the model will be extended to other Group Units.

The final figures per instrument type are saved in *df_bonds_AVA.xlsx* and *df_abs_AVA.xlsx* respectively. These files will store the portfolio information by ISIN of the whole process.

Additionally, files *df_bonds_AVA_distributed.xlsx* and *df_abs_AVA_distributed.xlsx* will be outputted with the AVA figures distributed by *country*, *book*, *desk*, *accounting portfolio*, *entity* or *portfolio* for each ISIN. The distribution level will be the same selected by the user in the Bonds and ABS execution. More information on the distributed adjustment calculation process can be found in section 6.1.3.

6 MODEL THEORY AND DESIGN

This section provides a detailed description of the new methodology proposed including formulas used, the hedging and netting mechanisms, with some examples for a better understanding of the critical points. It also includes the assumptions and possible limitations of the model.

6.1 Selection of model theory and approach

This section covers the description of the model: general methodology, scope of the model and AVAs formulas and calculation in detail. It also includes some examples of the critical points of the methodology approach.

6.1.1 Methodology approach

According to the EBA RTS *[5]*, Article 14, paragraph 1, the process to be applied respect to concentrated valuation positions has three steps:

1. Identify the concentrated positions.
2. Where a market price applicable for the size of the valuation position is unavailable, a prudent exit period must be estimated.
3. Only where the prudent exit period exceeds 10 days, an AVA must be applied taking into account the volatility of the valuation input, the volatility of the bid-offer spread and the impact of the hypothetical exit strategy on market prices.

For determining which positions are concentrated, paragraph 2 of the mentioned Article 14 of EBA RTS defines that the following aspects should be taken into account:

- The volume of the valuation positions relative to the liquidity of the related market.
- The institution's market access.
- The average daily traded volume of the portfolio positions, and typical daily traded volume of the institution.

Joining all that information we can conclude that in terms of AVAs, EBA considers that a position is concentrated if an estimated prudent exit period exceeds 10 days and in that case an AVA must be calculated. There are two aspects to solve:

1) The exit period estimation, which must consider aspects as: the size of the position, the institution's market access, the average daily traded volume and the typical daily traded volume of the institution.
2) Calculate an AVA for the concentrated positions considering the aspects mentioned in c).

6.1.1.1 Exit period estimation

From the aspects mentioned in the paragraph 2 of Article 14, the size of the position is the only number non-questionable and easy to obtain. The liquidity of the market can be measured according to the average daily traded volume, although usually, latent liquidity is much higher than the average observed traded volume. Even the average traded volume that seems an objective data, is not always easy to obtain, as the market is traded through different channels and the detail about the volumes is not always available. Note that all this is assuming that the impact method is applied, which is the preferred method as opposed to the alternative (add-on) method.

The institution market access is quite related with the ratio between the typical daily traded volume of the institution and the average daily traded volume. In practice, the former cannot be observed directly and what is proposed to do in order to implement the model, is to estimate that market access in terms of the available comparable figures of institution traded volume and average traded volumes. In this sense, probably that ratio or that estimated market access cannot be done at underlying level, but it will be desired the maximum possible granularity. Normally it will be easier to have a higher granularity (even at underlying level) for average daily traded volume. Finally, it should always be possible to have the size of the position at underlying level.

For each underlying, assuming that we have the size of the position and we manage to determine an applicable value for the average daily traded volume and the percentage of that volume that can be accessed by the bank, we can assume that it is possible for the bank to unwind each day the access percentage multiplied by the average traded volume and, therefore, the estimated exit period is:

$$Prudent\ Exit\ Period = \frac{Total\ Position}{\%\ access\ \cdot Average\ Daily\ Traded\ Volume} \quad (1)$$

Step b) of paragraph 1 of the Article, proposes a filter to discard some positions from concentration calculus if we are able to observe executable quotes with volumes higher than the bank position. In general, it is not easy to obtain data to apply this filter and if some quotes with volumes can be captured, in general the positions are larger than a particular offer. Thus, the approach is not applying any previous filter but estimating prudent exit periods for all the positions. And calculate an adjustment for those exceeding 10 days.

6.1.1.2 Calculation process

For level I and II assets, the calculation will not be performed by security, it will be performed by the buckets of the yield curve, grouping the positions in function of the duration. Thereafter, it will be estimated the market value loss in function of the volatility of the tenors and making a simple approach to the market value of the security through the duration (it will not be considered the convexity, because it covers asset portfolios). For the rest of positions (level III assets), given that they are securities without market price and no valuable through observable market factors, it must be applied a prudent AVA based on expert judgment.

In the case of securities, in the AVA should be considered also the concentration of the issuance by the comparison of portfolio position against the market traded amount.

For derivatives positions, the Santander Group operates in liquid and deep markets, so these products fall outside the scope of concentrated positions.

Please refer to *[18]* for consulting the corporate procedure for identifying the positions subject to a concentration adjustment. However, each unit is responsible for identifying operations in derivative markets with any limitations and included them in the analysis of the concentrated positions.

6.1.1.3 AVA quantification

The rational of this adjustment is that when exiting a position, it is expected that the exit price will suffer an impact if the size of the position is significant compared with the normal liquidity. In the literature, it is possible to find a significant variety of models to quantify the effect of the liquidity when exiting a position.

Model impact

The AVA methodology presented in this document is based on the model shown for instance in *[14]* and *[15]*, which is based on the estimated impact of a new market order ("model impact calculation"), assuming that we follow the usual practice for high positions, of splitting the volume into a list of smaller-size orders, executed along a period of days, so that the liquidity of the market can absorb them.

The model impact calculation collects the relation between the impact in the market price and the size of the position normalized by the daily volume (Q/V), as a concave function of the size of the position. The relation proposed in *[14]* and *[15]* is also contrasted by different studies through data from trading strategies, brokers and exchanges as is shown in *[16]* or in *[17]*. In particular, the model proposes that the expected impact in the price after a buy or a sell of that instrument is given by the next expression:

$$Price_{after} = Price_{before} \left(1 + I(Q)\right) \tag{2}$$

Where,

$$I(Q) = \epsilon \, Y \, \sigma \sqrt{\frac{Q}{V}} \tag{3}$$

Where Y is a constant of the order of 1 and σ is the daily volatility of the underlying. The sign of the impact will be positive for short positions ($\epsilon = +1$) and negative for long positions ($\epsilon = -1$). The expression is intended to be valid for any new order, independently of the institution sending it. Thus, no variables of the institution are included.

In particular, the papers assess that for a small trade of size q<Q, the expression is still valid and in particular, if we assume that the total trade is executed in a continuous way, the expression can be used with an infinitesimal q:

$$I(q) = \epsilon \, Y \, \sigma \sqrt{\frac{q}{V}} \tag{4}$$

Thus, the average impact in the price will be:

$$I_{Avg}(Q) = \frac{1}{Q}\int_0^Q I(q)\, dq = \frac{1}{Q}\int_0^Q \epsilon \, Y \, \sigma \sqrt{\frac{q}{V}}\, dq = \frac{1}{Q}\frac{\epsilon \, Y \, \sigma}{\sqrt{V}}\int_0^Q \sqrt{q}\, dq = \frac{1}{Q}\frac{\epsilon \, Y \, \sigma}{\sqrt{V}}\int_0^Q q^{1/2} dq = \ \ldots$$

$$\ldots \ = \frac{1}{Q}\frac{\epsilon \, Y \, \sigma}{\sqrt{V}}\frac{2}{3}\left[q^{3/2}\right]_0^Q = \frac{2}{3}\epsilon \, Y \, \sigma \sqrt{\frac{Q}{V}}$$

The value (v) of the position taking into account the average impact, or solving again the integral will be:

$$v(Q) = \int_0^Q Price_{before} \left(1 + I(q)\right) dq = Price_{before} \, Q \left(1 + \frac{2}{3}\epsilon \, Y \, \sigma \sqrt{\frac{Q}{V}}\right) \tag{5}$$

Or in terms of the "loss" ($\mathcal{L}$) suffered by the market price impact of the order:

$$\mathcal{L}(Q) = \left|\int_0^Q Price_{before} \, I(q)\, dq\right| = Price_{before} \, Q \, \frac{2}{3} \, Y \, \sigma \sqrt{\frac{Q}{V}} \tag{6}$$

Given that the regulation requires to calculate an AVA related to the excess of the exit period over 10 days, the methodology proposed for the AVA quantification is based on applying the impact formula (**4**), but corrected to collect only the impact of that excess. This is, for the part of the position that can be exit in 10 days or less ($Q_{1st\ 10\ days}$), the impact for AVA computation must be 0, while for the rest or the excess ($Pos - Q_{1st\ 10\ days}$) the impact moves with the formula above with that shift of $Q_{1st\ 10\ days}$. Thus, the methodology proposes the following impact formula to quantify the AVA:

$$I_{AVA}(q) = \begin{cases} 0 & for \quad 0 \le q \le Q_{1st\ 10\ days} \\ I(q - Q_{1st\ 10\ days}) & for \quad q > Q_{1st\ 10\ days} \end{cases} \qquad (7)$$

Applying the AVA impact expression to (**6**):

$$AVA(Pos) = \int_0^{Pos} Price_{before}\, I_{AVA}(q)\, dq$$
$$= Price_{before} \left(\int_0^{Q_{1st\ 10\ days}} 0\, dq + \int_{Q_{1st\ 10\ days}}^{Pos} I(q - Q_{1st\ 10\ days})\, dq \right)$$

With a variable change and denoting $Q_{Excess} = Pos - Q_{1st\ 10\ days}$

$$\xrightarrow[\begin{Bmatrix} s = q - Q_{1st\ 10\ days} \\ ds = dq \end{Bmatrix}]{} AVA(Pos) = \int_0^{Q_{Excess}} Price_{before}\, I(s)\, ds = Price_{before}\, Q_{Excess}\, \frac{2}{3}\, Y\, \sigma \sqrt{\frac{Q_{Excess}}{V}}$$

Note that the expression above is valid for any institution, unit or desk. However, given the same total position Pos, for a particular instrument, different institutions will have different "ability to trade in the market", different "typical daily trading volume of the institution", different prudent exit period, which results in a different value of Q_{Excess} and, therefore, the final AVA figure depends on the institution even having the same position. The expression must be applied individually for each concentrated position i (with $Q_{Excess}^i > 0$) with the values of the particular instrument associated with the position (its volatility σ_i, its average traded volume V_i, its $Price_{before}^i$ and the excess in that instrument. The total Concentration AVA will be the sum of each individual one.

$$\boxed{AVA(Pos_i) = Price_{before}^i\, Q_{Excess}^i\, \frac{2}{3}\, Y\, \sigma_i \sqrt{\frac{Q_{Excess}^i}{V_i}}} \qquad (8)$$

Add-on method

Notwithstanding the above, the group also has the possibility of using other methods of calculating concentration AVAs in their units on an exceptional manner when the model impact calculation cannot be applied. That is, with the goal of covering all the financial instruments casuistry, the market data availability and the systems' performance and capability, three different methodologies, apart from the model impact calculation, are proposed:

The add-on method is applicable to the general case to which multipliers in function of position size/market volume ratio will be defined. This method is particularly suitable for illiquid or low liquidity assets with few market references when it is necessary to apply an expert judgment.

In this case, the AVA will be calculated as a function of the Fair Value of the concentrated position, using a K multiplication factor which will be assesses in function of the leverage, understood as the ratio of the position size Q to the daily volume V, and the holding period length. The case the greater the Q/V ratio is, the more the leverage will be, so the multiplication factor will increase.

Leverage	Multiplier
Lev_1	K_1
Lev_2	K_2
$\vdots$	$\vdots$
Lev_L	K_L

$$AVA_{Concentrated\_Pos}(p_i) = K_l \cdot FairValue(p_i)$$

Where K_l = multiplication factor associated with leverage $Lev_l = \frac{Q_i}{V_i}$

When analyzing what leverage level, we must map with each position, we have to take into account that Q will be the remaining amount after the first 10 days so it will depend on the used exit strategy.

The K multiplication factor will be determined using real information of the settlement of concentrated positions that have occurred in the past, or by reference to similar products. If it is not possible to have this information, an expert judgment will be used.

6.1.1.4 AVA implementation

In practice, unless there are available real data from historical execution of concentrated positions to calibrate parameter Y we will take $Y = 1$. V is what we have called above $Average\ Daily\ Traded\ Volume$. The traded volume will be set to historical observed traded volumes of similar or the same instruments if available, and the market access will be determined according to the historically observed market access.

As the calculations must be "prudent", it is recommended to use a conservative one-day volatility σ, estimated from implicit or historical data. When using historical data, it is recommended to take a time window within last year, as the objective is not to perform a stress analysis but obtaining a prudent valuation with the current market uncertainty.

Once defined the inputs to compute the prudent exit period as in (**1**) the Q^i_{Excess} for concentrated positions to be used in (**8**) is directly obtained as:

$$Q^i_{Excess} = Pos_i - Q^i_{1st\ 10\ days} = Pos_i - 10 \cdot \%\ access\ \cdot Average\ Daily\ Traded\ Volume \quad (9)$$

Details on the determination of all these inputs can be found in the following subsections with some general ideas and some details on the tactical implementation.

6.1.1.5 Comments respect to some regulation details

It has been mentioned that the volatility to be used might be directly the historical volatility of the price or a prudent estimation or percentile of it. Regarding what is mentioned in step c) of paragraph 1 of Article 14, a study about the possible impact of the volatility of both, valuation input and bid-offer spread has been done (see details in Appendix I) concluding that the mid-price has a much higher volatility than the bid-offer spread, and that the correlation between them is low.

Finally, regarding the hypothetical strategy mentioned in the Article, as it has been mentioned the model used assumes that we would apply the usual strategy for unwinding high positions. This is, splitting the volume into a list of smaller-size orders, executed along a period of days, so that the liquidity of the market can absorb them.

The volume of the valuation positions relative to the liquidity of the market is a quantifiable value and can be deducted observing the market and the studied portfolio. Analogously, the average traded volume and the typical traded volume can be observed by consulting historical market sessions. The institutions market access is the only parameter that must be determined both based on market data but also based on expert judgement. It will be conveniently explained and justified in subsections below. All this has to be considered to apply (**9**) to obtain one of the inputs for AVA expression (**8**).

6.1.2 Positions and Valuation Inputs

In alignment with paragraph 4a in Article 9 of reference *[5]*, positions may be decomposed into more than one valuation inputs such that all inputs required to calculate an exit price for the position are treated separately. In the case of concentrated positions, the concentration of each risk factor will be analyzed specifically and individually. However, there will not be different implementations, but there will be one for products that value by position and another for those that value by sensitivity.

When no quotes are available, to obtain the prudent values needed, the approach will be based on prudent values from similar instruments. In other words, it will be necessary to develop proxies to cover the full scope of positions measured at fair value in the portfolio.

For calculating the volume for the AVA concentration adjustment, we consider the portfolio positions priced at fair value as of AVA exercise date. The required inputs are only the positions volume and the price (no decomposing into more than one valuation input is considered).

6.1.2.1 Market access percentage

One of the model inputs is the market access that the unit is assumed to have, for closing or hedging a position. Each unit will be responsible of calculating the market access percentage after the data that best represents its situation. This section aims to provide a calculation methodology.

The calculation process consists of dividing the relative volume traded by Santander (in comparison with the total market) by the ratio between Santander traded references and the total number of references traded in the market. In other words, the overall relative volume traded by Santander is adjusted estimating the part of the whole market associated to the references actively traded by Santander. This calculation is done, per desk:

$$\%Access_{Desk} = \frac{Traded\ Volume_{Santander} \Big/ \sum_{i\in\{Market\ Participants\}} Traded\ Volume_i}{Traded\ References_{Santander} \Big/ \sum_{i\in\{Market\ Participants\}} Traded\ References_i}$$

Is worth to note that the portion of the market to which Santander may have potentially access to if willing to close its portfolio is quite higher than the Santander normal % market activity used for the calculation. However, since it is difficult to quantify objectively a prudent approximation of that real capacity, the mentioned prudent approximation is considered.

6.1.2.2 Proxies definition

For the portfolio positions for which the inputs mentioned are not available, the approach will be using proxies based on the values of those inputs in similar instruments. Two different proxies were developed for this propose: the issuer proxy and the bucket proxy.

The issuer proxy will be used in a first stage and will only be used for proxying the average traded volume. The remaining data gaps after applying this proxy will be completed in the bucket proxy.

With this methodology the average volume for every ISIN of each issuer is calculated and assigned to the instruments of the same issuer with no available volume data.

On the other hand, for the bucket proxy, different categories or buckets will be defined with different level of granularity, applying always the most granular available. Missing volatilities and average traded volume data will be inferred through this methodology.

For generating the different proxy bucket values, a pool of instruments greater than the scope of positions in scope will be used. Note that the process to assign buckets for each ISIN is run separately for volumes and volatilities. Consequently, for the same ISIN the volume bucket and the volatility bucket could not be the same.

The characteristics of the instruments used to define the bucket proxy categories can be divided in two types, according to their relationship with the expected premiums:

- Progressive variables - They are defined as variables that can are expected to have different risk levels (and price) depending on the level of the variable.
- Non-progressive variables – They are useful to cluster the population. Despite the fact that a better behavior is expected in some cases there is not a clear expectation of a better or worse behavior in the different clusters.

As mentioned, in the bucket proxy a hierarchy of buckets is defined from more to less granular attending to all the axis mentioned or only part of them. This means that any position must have a minimum proxy level assigned to be classified and we need enough positions with data to build at least proxies for all the buckets defined to group the ratings.

6.1.2.3 Volatility

The volatility should be provided to the tool. Note that this is the proposed calculation as of model development date. We summarize here again the methodological issues which could be found when performing the calculation.

The volatility calculation is a one-day volatility, calculated from series of one-business-day returns. However, some methodological assumptions could require to be applied in case of data limitations.

First, it must be taken into consideration how, if the provided data is corrupt (missing data or with 0 values), the return will be zero or would not be able to be calculated (missing number or division by zero). Said returns would have to be deleted before the calculation is performed. Note that the return has been deleted, not the corrupt data, in order to keep always daily returns. An alternative approach could be interpolating the corrupt data according to the closest two valid observations, but this could distort the standard deviation making it smoother than it should.

Additionally, the standard deviation could be provided to the closest possible time span and then rescaled to one-day volatility. This could, however, distort the coherence among observations. In other to avoid additional assumptions on the subjacent distribution, this option is not preferred.

Due to data limitations, if in some positions where there is a constant price in AC along the whole month (such as ABS), the preferred approach would be using the series of available end-of-month prices, instead of the whole daily data.

If the returns are assumed to follow a normal distribution, and the volatility is linear in terms of time, when having one-month volatilities, multiplying by 12 we would obtain one-year volatilities, and dividing that by the number of business days in a year, one-day volatilities would be calculated.

6.1.2.4 Average daily traded volume

As explained in the previous section, and in line with the volatility input, the information it should be provided to the tool as well. Note that this is also the proposed calculation as of the date of development of this model.

For many positions, contributor monthly reports could be used. An average daily traded volume, therefore, could be calculated monthly by assuming 22 business-days per month.

It is to keep in mind how there could be references loaded on certain monthly reports, and not in others. These should not be considered in the calculation, as not to interpret that the instrument traded volume was zero. The reason for this is different contributors are inspired in a series of sources, although there is no guarantee that the whole market is covered in said reports. Therefore, there is no evidence that a reference has not been traded for a whole month if it does not appear in a file, and assuming that an instrument has not been traded would highly distort the final result. However, aiming to avoid including spurious trades, a minimum of observations should be guaranteed throughout the files.

In order to stay the most faithful to the provided data, when an instrument does not appear loaded in some files, but it does in others, the average could be provided only over the observed data.

Additionally, in order to gather the most representative information of those markets with very low availability of information, a shorter time-window one-month information has been considered and provided to the tool to collect the most recent information, but the averages have been calculated based only on the days where the instrument shows registers. This is, it has been considered that in days where there are no registers in the main source (Bloomberg, Markit, Reuters, etc.) means that brokers have not record any register that day, but does not mean that it could not be possible to find a buyer for that instrument that date, if it is asked.

6.1.3 Calculation of Adjustments

The calculation performed in order to obtain the aggregated concentration AVA of each position depends on the following inputs:

- Volume or position in the bank portfolios[2].
- Market price.
- Average daily traded volume.
- Volatility.
- Market access percentage.

The concentrated nominal is defined as the volume that is not expected to be able to be sold in 10 days, considering the average daily traded volume (V) and the bank market access for that particular instrument.

$$Q_{Excess} = Max\,(0\,, Pos - 10\ \cdot V \cdot Market\ access\,\%\,)$$

[2] Note that if the positions in certain portfolios have a particular accountable treatment that must be taken into account for AVA purposes, this should be explained in the implementation document of the particular unit.

$$AVA(Pos_i) = Price^i_{before}\ Q^i_{Excess}\ \frac{2}{3}\ Y\ \sigma_i \sqrt{\frac{Q^i_{Excess}}{V_i}} \quad (10)$$

For convenience, instead of applying directly expression (**8**), it can be defined an "average prudent price" to be considered only for the excess:

$$Price_{prudent} = Price_0 \left(1 + \frac{2}{3} \cdot \epsilon \cdot Y \cdot \sigma \cdot \sqrt{\frac{Q_{Excess}}{V}}\right)$$

Once the $Price_{prudent}$ value defined above is calculated, the AVA adjustment per concentration can be calculated as in the formula below:

$$AVA_{Concentration} = \sum_{i \in ISIN} -\frac{\left(Price^i_{before} - Price^i_{prudent}\right)}{100} \cdot Q^i_{Excess} \cdot FX_i$$

Where,

$ISIN$ is the positions subject to the concentration adjustment;

FX_i is the exchange rate between the position currency and the reference currency to consolidate AVAs for each underlying i.

Example:

The below example shows an example of how to calculate the Concentration AVA for a given bond, using the methodology described above.

ISIN	IT0005388480
Notional	47,197,588.54
Average daily traded volume	3,080,000.00
Concentrated Notional	16,397,588.54
AC Price	100.15
Volatility	0.003205 %
Market volume access	3,080,000.00
Prudent Price	99.65
Concentration AVA	80,949.91

Table 1: Terms in the calculation of the concentration AVA of the example

To obtain the concentration AVA distributed at *portfolio* level (or for any level among *country*, *book*, *desk*, *accounting portfolio*, *entity* or *portfolio*), the aggregated concentration AVA obtained at unit level per position is multiplied by the ratio between the absolute value of the notional corresponding to each *portfolio* level (or any of the levels mentioned above) and the total notional at unit level:

$$AVA^{ISIN}_{portfolio\_1} = AVA^{ISIN} \cdot \frac{|Notional_{portfolio\_1}|}{\sum_{portfolio\_i}|Notional_{portfolio\_i}|}$$

6.2 Model Assumptions and Limitations

This section reflects some general assumptions and limitations that affects the model as presented in this section without entering implementation details.

6.2.1 Insufficient Data Available

The main model limitation is related to the unavailability of some input data. Two different approaches are considered depending on the type of the missing data. When the rating of an instrument is missing, a conservative approach is taken, applying the worst available rating in the portfolio.

On the other hand, when other data are not available, they are proxied with the values observed for that data in other similar instruments. In this context “similar instruments” means that they belong to the same category.

For instance, the average traded volume of an instrument only traded in certain markets could be unavailable in the provided information, although the instrument could be rather liquid. The traded volume would be assumed to be the same as for the instruments in the same group or category.

6.2.2 Proxy fallbacks

In the case of needing a proxy, it may happen that the most granular proxy is not available (e.g., not enough members of that category with valid observations to build the proxy). In this case, the fallback consists of taking a proxy with the next lower level of granularity. If that proxy is neither available, the model moves to the next level and so on, using only the rating in the worst case. In case of the rating selected has not available data, the value obtained for the most punitive proxy available will be applied.

6.2.3 Bid-offer spread volatility

According to the EBA RTS *[5]*, the Concentration AVA must take into account the volatility of the valuation input, the volatility of the bid-offer spread and the impact of the exit strategy. Considering the application of MPU and CoC adjustments, what must be inferred from that RTS paragraph, is that the theoretical impact of unwinding concentrated positions, must be computed in terms of the exit price, not mid-prices. If the concentrated position is long or short, the impact must consider not only the possible effect in mid prices, but also the possible symmetrical or unsymmetrical widening of the bid-offer spreads.

However, the study presented in Appendix I: Mid and spread volatility study shows that the volatility and average movements of the size of bid-offer spreads (specifically for bonds) is quite reduced compared with the volatility and average movements of the mid-prices. Also, it is shown that the correlation between them is very low (below 20% in the cases analyzed) meaning that clear movements up or down of the prices do not have a clear impact on the bid-offer size which in any case remains quite stable.

On the other hand, note that we may compute the possible effect of spreads volatility by calculating the impacts on bid or on ask prices, depending on the position. As the positions are usually long, we will be using bid prices in general. Applying the same relative impact on bid prices will result in general less conservative than calculating the adjustments with the mid-price as reference.

For all this, and with a view of achieving a simpler but prudent model, the approach is to compute the mid-prices volatility and apply the effect on the mid-prices despite most positions are long. This does not mean that the volatility of bid-offer spreads is ignored but that its effect is already prudently collected by this approach even if that volatility is not explicitly incorporated in the calculations.

6.2.4 Average traded volume

Due to the OTC condition of some products, such as ABS, and because of the limited data availability, one of the assumptions that has been considered is that the average daily traded volume will be considered as the average traded volume of the available observations. Note that this definition is the one used at the date of development of this model.

The consideration of the number of days in the month where an executable quote has been offered, and not the total business days in the month is justified by the OTC. Considering only the available data and assuming that the trading of these instruments is limited to the observed, would return unfaithful and illogical values. The average daily traded volume, therefore, has been corrected by modifying the average value denominator, and normalizing by the number of days in which the instrument has been traded instead.

This would result in a prudent assumption, since the data used in order to estimate the market volume are solely the executable amounts posted by the counterparties. If Santander demanded proactively additional quotes, it would be feasible to obtain a higher number of executable bids.

7 MODEL DEVELOPMENT AND IMPLEMENTATION

As current document is a Model Theory, this section will not go into the implementation details from the perspective of the architecture, code structure, data model and other details of the particular tool developed to use the presented model. However, there is a list of details that have not being included in the Model Theory and Design section to avoid overloading that part and confusing the reader with many details. Those details take part of the model in the sense that the theoretical basis developed in Section 6 have to be implemented effectively and the ideas behind are expected to be as global as the rest as long as the type of inputs used by the unit in particular, are similar to the ones used here. They are presented here grouped by adjustment.

Note that most of the ideas developed here can be seen as building the inputs for the AVA calculator. The developed tool will always have the possibility of being fed directly with inputs calibrated outside with a methodology conveniently justified and documented.

7.1 Selection of calibration data

This section collects a summary of the exploratory analysis of market data required by methodological standard 9 for AVAs (see *[2]*).

In order to develop the present methodology, valuation exposures from the Supra Datalake have been considered. These valuation exposures will be calculated for all underlyings where the unit presents an open position.

Therefore, the following paragraphs describe details and evidence from the methodology used for fixed income securities, being a particular case of the total scope of Concentrated Positions. However, it should be noted that this is a specific example for fixed income products, but the analysis also covers other positions, such as equity products or derivatives.

The main valuation inputs are the market access percentage, the average traded volume and the volatility of the underlying price. The rest of the parameters are portfolio data –such as notional or AC price–, which should be provided, and no calculus would be required.

7.1.1 Proxy construction

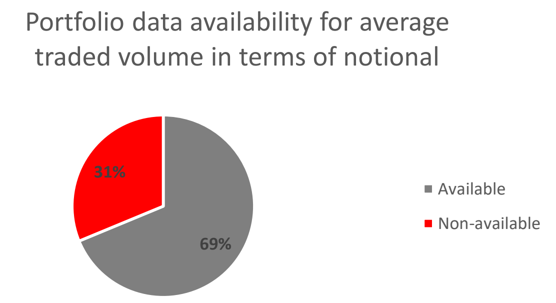
The following section presents the proxy construction and the detail on the chosen buckets. The detail will be presented for Bonds and ABS, which do not complete the scope of instruments which could be subject to a concentration adjustment.

Since the proxy buckets are not parametrizable for the user, for showing the proxy data coverage the Boadilla data as of 31/03/2021 will be used.

i. *Bonds*

For bonds, the valuation inputs are the notional, the historical one-day volatility and the price in model execution date as loaded in AC. Additionally, Markit information regarding traded volumes are required as to generate the needed inputs for calculating the concentration AVA. Every available Markit data and every available historical series is considered.

First, let us differentiate among the references in the portfolio which have data loaded for average traded volume and volatility, and do not need to be proxied. For the portfolio instruments as of 31/03/2021, in EUR, the data coverage in terms of notional is shown below.



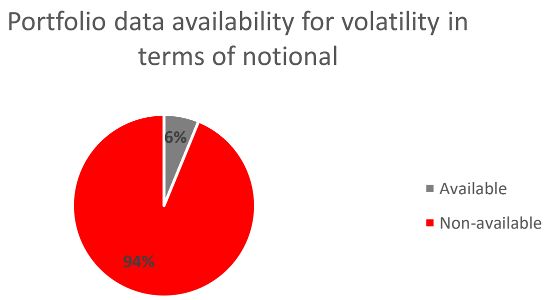


Figure 1:Data coverage for average traded volume and volatility in terms of notional (EUR) for bond portfolio as of 31/03/2021

As detailed in section 6.1.2.2, the chosen buckets for generating the proxy are the rating, the term to maturity, the industry and the region. The static data must be modified beforehand in order to group by the proxy identifiers.

- The industry is mapped to segments Financial Institutions, Government, Government EUR, SPGB and Covered bonds.
- The rating is codified to tranches AAA to A, BBB to B and CCC to D. Additionally, the missing ratings will be mapped to the worst tranche with bonds in the portfolio (if there are no bonds belonging to the CCC to D tranche, bonds with missing ratings will not be mapped to that tranche, but to the worst one with representation in the portfolio).
- The maturities will be categorized as: under three years, between three and seven and over seven years.
- Finally, the region is mapped to Europe, LATAM, North America and others.

Proxies per bucket will be defined for those bonds without average traded volume or volatility information. In order to have an idea of the relevance of those proxies, the following tables show the percentage (in terms of notional in EUR) of them within each tranche of each dimension.

Missing average traded volume

Rating	Notional of missing data	Relative percentage to dimension	Relative percentage to portfolio
AAA to A	1,001,432,539	16.87%	4.81%
BBB to B	5,496,969,559	37.03%	26.42%
CCC to D[3]	3,962,728	16.48%	0.02%
TOTAL	6,502,364,827	-	31.25%

Table 2: Notional and relative weight of instruments with missing average traded volume data per rating

Maturity	Notional of missing data	Relative percentage to dimension	Relative percentage to portfolio
t < 3Y	5,365,221,330	42.30%	25.79%
3Y <= t <= 7Y	295,910,490	7.26%	1.42%
t > 7Y	841,233,006	20.81%	4.04%
TOTAL	6,502,364,827	-	31.25%

Table 3: Notional and relative weight of instruments with missing average traded volume data per maturity

Industry	Notional of missing data	Relative percentage to dimension	Relative percentage to portfolio
Governments	166,322,480	20.65%	0.80%
Governments EUR	1,937,189,753	50.18%	9.31%
Cover_Bond	45,985,362	2.10%	0.22%
Financial Institutions	283,981,475	11.13%	1.36%
Other	564,341,754	22.82%	2.71%
SPGB	3,504,544,000	39.26%	16.84%
TOTAL	6,502,364,827	-	31.25%

Table 4:Notional and relative weight of instruments with missing average traded volume data per industry

Region	Notional of missing data	Relative percentage to dimension	Relative percentage to portfolio
Europe	5,701,851,377	32.83%	27.41%
LATAM	61,387,999	7.36%	0.30%
North America	155,959,820	14.91%	0.75%
Others	583,165,630	37.38%	2.80%
TOTAL	6,502,364,827	-	31.25%

Table 5: Notional and relative weight of instruments with missing average traded volume data per region

Therefore, the proxy will have higher relevance in:

- In terms or rating, the *BBB to B* have higher relative notional with missing average traded volume (in part because this tranche includes the instruments with missing rating).
- In terms of maturity, the shorter term (for the rest of maturity tranches the proxy for volume will not be relevant).
- As for the industry group, category “*Other*“ is where the proxy has a higher weight.
- About region, the greatest notional which should be proxied belongs to *Europe* region.

Missing volatility data

Rating	Notional of missing volatility	Relative percentage to dimension	Relative percentage to portfolio
AAA to A	5,085,938,748	85.68%	24.44%
BBB to B	14,407,629,771	97.05%	69.25%
CCC to D[4]	23,166,823	96.37%	0.11%
TOTAL	19,516,735,343	-	93.80%

[3] This row contains the informed CCC to D rating instruments as well as those without informed rating.
[4] This row contains the informed CCC to D rating instruments as well as those without informed rating.

Table 6: Notional and relative weight of instruments with missing volatility data per region

Maturity	Notional of missing volatility	Relative percentage to dimension	Relative percentage to portfolio
t < 3Y	12,322,057,082	97.14%	59.22%
3Y <= t <= 7Y	3,557,079,518	87.23%	17.10%
t > 7Y	3,637,598,742	89.98%	17.48%
TOTAL	19,516,735,343	-	96.97%

Table 7: Notional and relative weight of instruments with missing volatility data per maturity tranche

Industry	Notional of missing volatility	Relative percentage to dimension	Relative percentage to portfolio
Governments	557,345,787	69.21%	2.68%
Governments EUR	3,693,781,961	95.68%	17.75%
Cover_Bond	1,988,493,211	90.82%	9.56%
Financial Institutions	1,972,732,507	77.32%	9.48%
Other	2,448,772,234	99.01%	11.77%
SPGB	8,855,609,640	99.22%	42.56%
TOTAL	19,516,735,343	-	93.80%

Table 8: Notional and relative weight of instruments with missing volatility data per industry group

Region	Notional of missing volatility	Relative percentage to dimension	Relative percentage to portfolio
Europe	16,331,427,535	94.04%	78.49%
LATAM	585,983,385	70.27%	2.82%
North America	1,041,258,973	99.52%	5.00%
Others	1,558,065,450	99.88%	7.49%
TOTAL	19,516,735,343	-	93.80%

Table 9: Notional and relative weight of instruments with missing volatility data per region

Therefore, the volatility proxy will have higher relevance in:

- Similarly to what happens for volume, rating tranche *BBB to B* have the most missing data.
- In terms of maturity, again, the shorter term lacks the most data, and no other maturity shows a significant weight of the volatility proxy.
- As for the industry group, the *SPGB* category followed by the *Governments EUR,* is missing the most amount of data.
- Finally, for the region, again *Europe* is the segment with higher weight of the proxy.

The aspects included in the proxies categories in order are:

1. Rating.
2. Maturity tranche.
3. Industry.
4. Region.

From a qualitative point of view, the different axis are discussed and presented in 6.1.2.2. However, the rating would determine the credit quality of the issuer, followed by the maturity. These two dimensions determine the risk associated with the instrument, and therefore these are the main drivers for proxying.

On a deeper level, when needing to proxy, the industry and region are chosen, which would inform the holder of qualitative data of the instrument.

Once these bucket keys have been defined, the portfolio is proxied when needed. Tables below show the notional not having an average traded volume and/or volatility -i.e., requiring a proxy for these variables- and the amount of this covered within each proxy respectively, through different levels. For consulting the proxy calibration instrument pool, consult Appendix III: proxy calibration instrument POOL description.

For the notional which can be inferred through a proxy without applying any fallbacks (this is, considering every key, since every static data field has been provided) is summarized in tables below, for the average traded volume and the volatility respectively.

Rating	Maturity	Industry group	Region	Portfolio notional missing average traded volume (abs)	Notional relative to portfolio
AAA to A	3Y <= t <= 7Y	Cover_Bond	Europe	300,000	0.00144%
			Others	300,000	0.00144%
		Financial Institutions	Europe	67,754,563	0.32565%
			North America	84,531,193	0.40629%
		Governments EUR	Europe	1,800,000	0.00865%
			Others	5,730,000	0.02754%
		Others	Europe	3,000,000	0.01442%
			North America	6,356,709	0.03055%
			Others	35,020,195	0.16832%
		SPGB	Europe	9,200,000	0.04422%
	t < 3Y	Financial Institutions	Europe	20,210,218	0.09714%
		Governments	North America	4,808,280	0.02311%
		Governments EUR	Others	600,000	0.00288%
		Others	Others	251,898,435	1.21071%
	t > 7Y	Cover_Bond	Europe	45,385,363	0.21814%
		Financial Institutions	Europe	100,104,599	0.48114%
		Governments	LATAM	3,620,879	0.01740%
			North America	38,521,658	0.18515%
		Governments EUR	Europe	26,660,000	0.12814%
			Others	87,398,000	0.42006%
		Others	Europe	1,415,590	0.00680%
			North America	8,597,857	0.04132%
			Others	195,219,000	0.93829%
		SPGB	Europe	3,000,000	0.01442%
BBB to B	3Y <= t <= 7Y	Financial Institutions	Europe	25,506,919	0.12260%
			LATAM	98,610	0.00047%
			North America	1,640,925	0.00789%
		Others	Europe	5,803,909	0.02790%
			LATAM	305,611	0.00147%
			North America	3,720,305	0.01788%
		SPGB	Europe	44,681,000	0.21475%
	t < 3Y	Financial Institutions	Europe	48,769,113	0.23440%
			North America	8,150	0.00004%

Rating	Maturity	Industry group	Region	Portfolio notional missing average traded volume (abs)	Notional relative to portfolio
		Governments EUR	Europe	1,797,000,000	8.63700%
		Others	North America	806,813	0.00388%
			Others	7,000,000	0.03364%
		SPGB	Europe	3,232,197,000	15.53505%
	t > 7Y	Financial Institutions	Europe	16,936,583	0.08140%
			LATAM	506,907	0.00244%
			North America	2,444,888	0.01175%
		Governments	LATAM	32,917,159	0.15821%
		Governments EUR	Europe	7,987,754	0.03839%
			LATAM	10,014,000	0.04813%
		Others	Europe	28,672,767	0.13781%
			LATAM	9,962,104	0.04788%
			North America	4,523,043	0.02174%
		SPGB	Europe	215,466,000	1.03560%
CCC to D	3Y <= t <= 7Y	Others	LATAM	160,550	0.00077%
	t < 3Y	Governments	LATAM	1,923,312	0.00924%
		Others	LATAM	11	0.00000%
	t > 7Y	Others	LATAM	1,878,856	0.00903%

Table 10: Bond portfolio notional missing the average traded volume per bucket at deepest level as of 31/03/2021

Rating	Maturity	Industry group	Region	Portfolio notional missing voaltility (abs)	Notional relative to portfolio
AAA to A	3Y <= t <= 7Y	Cover_Bond	Europe	318,938,680	1.53293%
			North America	60,953,000	0.29296%
			Others	55,518,439	0.26684%
		Financial Institutions	Europe	380,711,510	1.82983%
			LATAM	26,079	0.00013%
			North America	41,732,593	0.20058%
			Others	4,448,808	0.02138%
		Governments	Europe	26,865,723	0.12913%
			LATAM	55,417	0.00027%
			North America	86,303,737	0.41481%
			Others	108,390	0.00052%
		Governments EUR	Europe	96,948,557	0.46597%
			LATAM	5,505,000	0.02646%
			Others	21,839,500	0.10497%
		Others	Europe	128,046,003	0.61543%
			LATAM	2,046,371	0.00984%
			North America	242,734,058	1.16666%
			Others	42,485,902	0.20420%
		SPGB	Europe	29,416,000	0.14138%
	t < 3Y	Cover_Bond	Europe	984,519,094	4.73194%

Rating	Maturity	Industry group	Region	Portfolio notional missing voaltility (abs)	Notional relative to portfolio
			North America	78,691,910	0.37822%
			Others	323,280,140	1.55380%
		Financial Institutions	Europe	240,351,580	1.15521%
			LATAM	95,351	0.00046%
			North America	56,663,678	0.27235%
			Others	3,772,000	0.01813%
		Governments	Europe	33,473,654	0.16089%
			LATAM	647,080	0.00311%
			North America	5,623,243	0.02703%
		Governments EUR	Europe	92,993,864	0.44696%
			Others	108,576,860	0.52186%
		Others	Europe	12,028,973	0.05782%
			North America	697,599	0.00335%
			Others	348,210,516	1.67362%
		SPGB	Europe	5,085,331	0.02444%
	t > 7Y	Cover_Bond	Europe	102,626,947	0.49326%
			Others	165,000	0.00079%
		Financial Institutions	Europe	146,433,529	0.70381%
			North America	894,467	0.00430%
			Others	10,100,000	0.04854%
		Governments	Europe	39,932,764	0.19193%
			LATAM	29,980,033	0.14409%
			North America	46,252,801	0.22231%
		Governments EUR	Europe	97,316,767	0.46774%
			LATAM	6,337,000	0.03046%
			Others	228,327,000	1.09742%
		Others	Europe	26,621,604	0.12795%
			LATAM	18,677,316	0.08977%
			North America	34,348,991	0.16509%
			Others	378,004,000	1.81682%
		SPGB	Europe	80,525,888	0.38704%
BBB to B	3Y <= t <= 7Y	Cover_Bond	Europe	8,600,000	0.04133%
			Financial Institutions	570,739,499	2.74317%
			Europe	531,460,193	2.55438%
			LATAM	6,953,262	0.03342%
			North America	32,075,230	0.15416%
			Others	250,815	0.00121%
		Governments	LATAM	59,408,053	0.28554%
		Governments EUR	Europe	119,001,732	0.57196%
			LATAM	4,768,000	0.02292%
			Others	200,000	0.00096%
		Others	Europe	354,520,802	1.70395%
			LATAM	56,099,314	0.26963%
			North America	134,296,156	0.64547%

Rating	Maturity	Industry group	Region	Portfolio notional missing voaltility (abs)	Notional relative to portfolio
			Others	4,954,973	0.02382%
		SPGB	Europe	698,329,719	3.35641%
	t < 3Y	Cover_Bond	Europe	48,200,000	0.23167%
		Financial Institutions	Europe	278,702,844	1.33954%
			LATAM	567,214	0.00273%
			North America	96,078,371	0.46179%
			Others	2,256,000	0.01084%
		Governments	LATAM	541,157	0.00260%
			Others	40,748	0.00020%
		Governments EUR	Europe	2,712,687,951	13.03811%
			LATAM	715,000	0.00344%
		Others	Europe	170,111,190	0.81761%
			LATAM	11,787,166	0.05665%
			North America	70,831,317	0.34044%
			Others	7,400,000	0.03557%
		SPGB	Europe	6,624,864,900	31.84138%
	t > 7Y	Cover_Bond	Europe	7,000,000	0.03364%
		Financial Institutions	Europe	121,871,596	0.58576%
			LATAM	8,835,826	0.04247%
			North America	7,605,298	0.03655%
			Others	545,210	0.00262%
		Governments	LATAM	209,140,627	1.00520%
			Others	593,293	0.00285%
		Governments EUR	Europe	165,270,479	0.79435%
			LATAM	30,095,000	0.14465%
			Others	2,835,000	0.01363%
		Others	Europe	229,961,336	1.10527%
			LATAM	111,156,815	0.53426%
			North America	45,476,525	0.21858%
			Others	14,152,855	0.06802%
		SPGB	Europe	1,417,387,803	6.81245%
CCC to D	3Y <= t <= 7Y	Financial Institutions	LATAM	7,335	0.00004%
		Governments	LATAM	50,632	0.00024%
		Governments EUR	LATAM	127,000	0.00061%
		Others	Europe	420,521	0.00202%
			LATAM	872,013	0.00419%
	t < 3Y	Governments	LATAM	2,249,405	0.01081%
		Others	LATAM	312,946	0.00150%
	t > 7Y	Financial Institutions	Europe	200,000	0.00096%
			LATAM	93,721	0.00045%
		Governments	LATAM	16,079,029	0.07728%
		Governments EUR	LATAM	237,251	0.00114%
		Others	LATAM	2,516,972	0.01210%

Table 11: Bond portfolio notional missing the volatility per bucket at deepest level as of 31/03/2021

As there are some missing information throughout the different fields which are used for defining the proxies, and the proxies are hierarchical, the bonds will be proxied to different levels of the hierarchy, according to their available information. At best, they will be proxied o the deepest level (all the information is available), while at worst they will be proxied to the first level (only the rating). From now on, when a bond cannot be categorized to the deepest level will be referred as the application of a fallback. If a bond has no available information, three fallbacks, or the final fallback, will be applied. In the next paragraphs, an analysis of the fallbacks applied have been carried out.

Firstly, the fallbacks of those bonds missing both volatility and average traded volume is exposed.

Rating	Maturity	Industry group	Portfolio absolute notional missing volatility and average traded volume	Percentage over total notional
AAA to A	3Y <= t <= 7Y	Cover_Bond	300,000	0.00144%
		Financial Institutions	54,254,563	0.26077%
		Governments	84,531,193	0.40629%
		Governments EUR	5,730,000	0.02754%
		Others	44,376,905	0.21329%
		SPGB	9,200,000	0.04422%
	t < 3Y	Financial Institutions	20,210,218	0.09714%
		Governments	4,808,280	0.02311%
		Governments EUR	600,000	0.00288%
		Others	251,898,435	1.21071%
	t > 7Y	Cover_Bond	28,285,363	0.13595%
		Financial Institutions	59,604,599	0.28648%
		Governments	42,142,537	0.20255%
		Governments EUR	110,498,000	0.53109%
		Others	205,232,447	0.98642%
		SPGB	3,000,000	0.01442%
BBB to B	3Y <= t <= 7Y	Financial Institutions	27,239,454	0.13092%
		Others	9,829,825	0.04725%
		SPGB	44,681,000	0.21475%
	t < 3Y	Financial Institutions	48,777,263	0.23444%
		Governments EUR	1,797,000,000	8.63700%
		Others	7,806,813	0.03752%
		SPGB	3,232,197,000	15.53505%
	t > 7Y	Financial Institutions	19,888,378	0.09559%
		Governments	32,917,159	0.15821%
		Governments EUR	18,001,754	0.08652%
		Others	42,957,914	0.20647%
		SPGB	215,466,000	1.03560%
CCC to D	3Y <= t <= 7Y	Others	160,550	0.00077%
	t < 3Y	Governments	1,923,312	0.00924%
	t > 7Y	Others	1,878,856	0.00903%

Table 12: Bond portfolio notional missing the volatility per bucket at second depth level as of 31/03/2021

Secondly, the instruments proxied to the greatest level fallback for inferring the average traded volume and/or the volatility are shown respectively in tables below. No instruments are proxied -as of 31/03/2021- by applying two fallbacks.

Rating	Portfolio notional missing average traded volume (abs)	Notional relative to portfolio
AAA to A	1,001,432,539	4.81323%
BBB to B	5,496,969,560	26.42033%
CCC to D	3,962,728	0.01905%

Table 13: Bond portfolio notional missing the average traded volume per bucket at least depth level as of 31/03/2021

Rating	Portfolio notional missing volatility (abs)	Notional relative to portfolio
AAA to A	5,085,938,749	24.44477%
BBB to B	14,407,629,771	69.24803%
CCC to D	23,166,823	0.11135%

Table 14: Bond portfolio notional missing the volatility per bucket at least depth level as of 31/03/2021

The summary of the proxied notional per fallback is presented in the table below:

	Proxied average traded volume only	Proxied volatility only	Proxied average traded volume and volatility
No fallback	6,425,397,817	13,168,304,537	1,212,130,109
One fallback	0	0	0
Two fallbacks	0	0	0
Final fallback	0	0	0

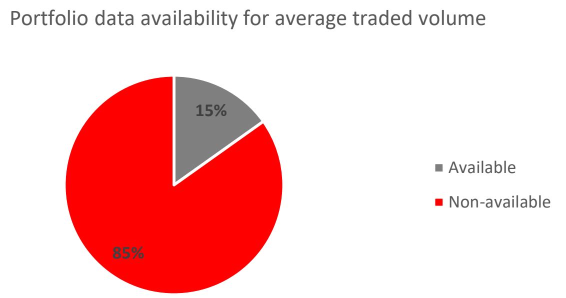
Table 15: Disaggregated proxied notional at different depth levels for bond portfolio as of 31/03/2021

Therefore, as the number of instruments covered at the highest proxy level is rather high, and the notional non-covered by these -and therefore having to apply the last level fallback- is low in comparison to the total portfolio notional (besides the instruments with missing every piece data), the chosen keys for generating the buckets as well as its order was found to be optimal.

ii. ABS

For ABS, the same information is required, although the data source varies. The traded volumes are obtained from RUNS Bloomberg downloads instead. Additionally, as only one-month data is considered, there will be a greater need for proxying the data, which will be discussed in this section.

As for bonds, let us differentiate among the references in the portfolio which lack average traded volume or volatility in terms of notional, and those which do not require to be proxied. For the ABS portfolio as of 31/03/2021, in EUR, results are shown below.



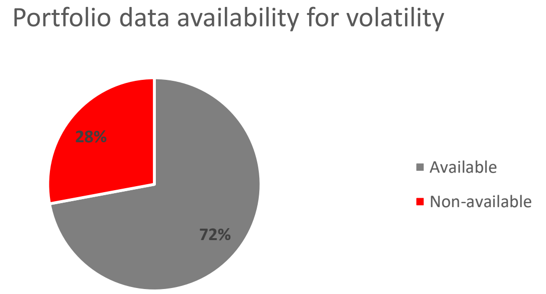


Figure 2: Data coverage for average traded volume and volatility in terms of notional (EUR) for ABS portfolio as of 31/03/2021

As mentioned in 6.1.2.2, the chosen keys for generating each bucket are the rating tranche and instrument type. Before bucketing takes place, the rating must be modified, as for bonds, to rating trances, where *AAA to A*, *BBB to B* and *CCC to D* ratings are mapped as for generating the buckets. The following total and relative notional (in EUR) would need a proxy:

Average traded volume

Rating	Notional of missing average traded volume	Relative percentage to dimension	Relative percentage to portfolio
AAA to A	3,235,408,096	82.81%	74.15%
BBB to B	0	0.00%	0.00%
CCC to D[5]	456,215,147	100%	10.45%
TOTAL	3,691,623,244	-	84.60%

Table 16: Portfolio notional of ISINs with missing average traded volume data and relative weight per rating

Instrument type	Notional of missing average traded volume	Relative percentage to dimension	Relative percentage to portfolio
LL	3,201,288,474	97.63%	73.37%
Whole Loan	221,221,487	32.85%	5.07%
ABS	221,149,995	60.92%	5.07%
SME	848,140	100.00%	0.02%
Non-informed	47,115,147	100.00%	1.08%

[5] This row contains the informed CCC to D rating instruments as well as those without informed rating.

Instrument type	Notional of missing average traded volume	Relative percentage to dimension	Relative percentage to portfolio
TOTAL	3,691,623,244	-	84.60%

Table 17: Portfolio notional of ISINs with missing average traded volume data and relative weight per instrument type

Volatility

Rating	Notional of missing volatility	Relative percentage to dimension	Relative percentage to portfolio
AAA to A	887,765,610	22.72%	20.35%
BBB to B	0	0.00%	0.00%
CCC to D[6]	281,715,147	61.75%	6.46%
TOTAL	1,169,480,758	-	26.81%

Table 18: Portfolio notional of ISINs with missing volatility data and relative weight per rating

Instrument type	Notional of missing volatility	Relative percentage to dimension	Relative percentage to portfolio
LL	979,050,000	29.86%	22.44%
Whole Loan	9,220,346	1.37%	0.21%
ABS	159,595,263	43.96%	3.66%
SME	0	0.00%	0.00%
Non-informed	21,615,147	45.88%	0.49%
TOTAL	1,169,480,758	-	26.82%

Table 19: Portfolio notional of ISINs with missing volatility data and relative weight per instrument type

The order of the proxy dimensions would be rating tranche first, and then instrument type. The reason for not including any more dimensions is due to the limited available data.

As for bonds, the following tables show the 31/03/2021 notional proxied at deepest proxy level for the average traded volume and the volatility respectively. For giving a sense of magnitude, the ABS portfolio as of model development date is of 4,363,421,684.59€.

Rating	Instrument type	Portfolio notional missing average traded volume (abs)	Notional relative to portfolio
AAA to A	ABS	72,649,995	1.66498%
	LL	2,916,688,474	66.84407%
	SME	848,140	0.01944%
	Whole Loan	245,221,487	5.61994%

Table 20: ABS portfolio notional missing the average traded volume per bucket at deepest level as of 31/03/2021

Rating	Instrument type	Portfolio notional missing volatility (abs)	Notional relative to portfolio
AAA to A	ABS	11,095,263	0.25428%
	LL	843,450,000	19.33001%
	Whole Loan	33,220,346	0.76134%

Table 21: ABS portfolio notional missing the volatility per bucket at deepest level as of 31/03/2021

When applying the last fallback, the results are the following.

Rating	Portfolio notional missing average traded volume (abs)	Notional relative to portfolio
CCC to D	524,215,147	12.01385%

[6] This row contains the informed CCC to D rating instruments as well as those without informed rating.

Table 22: ABS portfolio notional missing the average traded volume per bucket at last fallback level as of 31/03/2021

Rating	Portfolio notional missing volatility (abs)	Notional relative to portfolio
CCC to D	349,715,147	8.01470%

Table 23: ABS portfolio notional missing the volatility per bucket at last fallback level as of 31/03/2021

As before, the summary of the proxied notional per fallback level is shown in table below.

	Proxied average traded volume only	Proxied volatility only	Proxied average traded volumen and volatility
No fallback	2,533,356,618	36,714,132	1,111,151,477
Final fallback	25,500,000	0	21,615,147

Table 24: Disaggregated proxied notional at different depth levels for ABS portfolio as of 31/03/2021

As the available data is much limited for the ABS, the resulting proxied ciphers are not as the ones shown per bonds, although the amount of notional covered with every key is found to be best.

7.2 Model testing

This subsection describes model testing performed, which must ensure that the implementation is correct, the model is accurate, stable and robust, the inputs are appropriate for the model and the outputs are suitable for the intended use.

The model tests included, illustrate the efficiency of each of the changes considered (in both the methodology and the input selection), through comparatives with respect to the previous situation.

As we stated above, it should be noted that this is a specific example for fixed income products, but the analysis also covers other positions, such as equity products or derivatives.

7.2.1 Average versus 50-percentile for bucket middle value

A considered model parametrization was to apply a percentile 50 to the observations instead of an average value. However, the tool would allow the user to modify this, and calculate an average as a bucket middle value instead.

Table below shows the portfolio average traded volume and its variation for bonds after the average application.

Rating	Maturity	Industry group	Portfolio average traded volume (average mid value)	Relative change
AAA to A	3Y <= t <= 7Y	Cover_Bond	34,923,577	71%
		Financial Institutions	1,117,503,066	175%
		Governments	1,152,923,312	106%
		Governments EUR	508,192,645	726%
		Others	921,029,695	156%
		SPGB	417,464,118	1715%
	t < 3Y	Financial Institutions	192,678,764	113%
		Governments	108,683,535	53%
		Governments EUR	139,609,919	231%
		Others	323,682,134	152%

Rating	Maturity	Industry group	Portfolio average traded volume (average mid value)	Relative change
	t > 7Y	Cover_Bond	123,554,089	83%
		Financial Institutions	415,837,699	448%
		Governments	692,401,310	60%
		Governments EUR	2,339,919,186	476%
		Others	207,809,199	157%
		SPGB	460,005,421	744%
BBB to B	3Y <= t <= 7Y	Financial Institutions	147,795,921	68%
		Others	96,184,704	85%
		SPGB	1,238,863,068	1143%
	t < 3Y	Financial Institutions	34,973,706	83%
		Governments EUR	1,535,953,314	58%
		Others	19,044,853	102%
		SPGB	1,228,762,652	58%
	t > 7Y	Financial Institutions	220,162,522	55%
		Governments	172,731,448	59%
		Governments EUR	240,989,006	565%
		Others	299,674,875	84%
		SPGB	574,911,491	3617%
CCC to D	3Y <= t <= 7Y	Others	15,928,854	193%
	t < 3Y	Governments	14,859,955	376%
		Others	2,461,993	23%
	t > 7Y	Others	8,144,578	297%

Table 25: Average traded volume in EUR when calculating the bucket middle values with an average instead of percentile 50 for bonds..

As percentage variation column shows, the average traded volume is always higher when the average is used as the mid value instead of the percentile 50. In the following table the same analysis for the volatility proxy is shown.

Rating	Maturity	Industry group	Portfolio volatility (average mid value)	Relative change
AAA to A	3Y <= t <= 7Y	Cover_Bond	0.00088	9%
		Financial Institutions	0.00109	11%
		Governments	0.00109	19%
		Governments EUR	0.00105	17%
		Others	0.00100	14%
		SPGB	0.00109	19%
	t < 3Y	Cover_Bond	0.00023	-4%
		Financial Institutions	0.00063	75%
		Governments	0.00024	3%
		Governments EUR	0.00024	2%
		Others	0.00028	10%
		SPGB	0.00024	3%
	t > 7Y	Cover_Bond	0.00269	20%
		Financial Institutions	0.00302	0%
		Governments	0.00532	8%

		Governments EUR	0.00495	8%
		Others	0.00378	22%
		SPGB	0.00532	8%
BBB to B	3Y <= t <= 7Y	Cover_Bond	0.00339	58%
		Financial Institutions	0.00334	69%
		Governments	0.00313	23%
		Governments EUR	0.00231	8%
		Others	0.00388	34%
		SPGB	0.00193	-2%
	t < 3Y	Cover_Bond	0.00167	84%
		Financial Institutions	0.00092	-5%
		Governments	0.00237	136%
		Governments EUR	0.00223	131%
		Others	0.00189	161%
		SPGB	0.00221	130%
	t > 7Y	Cover_Bond	0.01414	155%
		Financial Institutions	0.00881	-12%
		Governments	0.02170	313%
		Governments EUR	0.02170	313%
		Others	0.01414	155%
		SPGB	0.02170	313%
CCC to D	3Y <= t <= 7Y	Financial Institutions	0.01751	22%
		Governments	0.01751	22%
		Governments EUR	0.01751	22%
		Others	0.01751	22%
	t < 3Y	Governments	0.01203	0%
		Others	0.01203	0%
	t > 7Y	Financial Institutions	0.01751	22%
		Governments	0.01751	22%
		Governments EUR	0.01751	22%
		Others	0.01751	22%

Table 26: Volatility in EUR when calculating the bucket middle values with an average instead of percentile 50 for bonds.

Similarly, using the percentile 50 the model is more conservative as the volatilities obtained using the average are lower.

The following two tables show the same analysis for ABS.

Rating	Instrument type	Portfolio average traded volume	Percentage variation
AAA to A	ABS	52,500,000	0%
	LL	838,125,000	0%
	SME	4,136,646	0%
	Whole Loan	207,049,500	0%
CCC to D	ABS	12,000,000	0%
	LL	33,000,000	0%
	Whole Loan	6,000,000	0%

Table 27: Average traded volume in EUR when calculating the bucket middle values with an average instead of percentile 50 for ABS

Rating	Instrument type	Portfolio volatility mean	Percentage variation
AAA to A	ABS	0.00167	0%
	LL	0.00688	0%
	Whole Loan	0.00386	0%
CCC to D	ABS	0.02378	172%
	LL	0.00682	-22%
	Whole Loan	0.00986	13%

Table 28: Volatility in EUR when calculating the bucket middle values with an average instead of percentile 50 for bonds.

The ABS output does not vary at all. The reason for this is that, in both cases, the ABSs which are generating concentration adjustment have enough data for calculating the adjustments. However, the bucket values when considering the mean instead of the 50-percentile increase, and therefore the same conclusion for the bonds could apply.

Even though the election of the percentile 50 or the average entail an aggressive change in the output figures, the percentile 50 was chosen as the preferred one, as to be consistent with the bonds and ABS FVA and AVA model. Additionally, since the percentile 50 represent a mid-value much more insensitive to extreme values in the provided distribution, the election of the percentile 50 will allow for a more stable output.

7.2.2 Model stability through time

An additional challenge to the developed model was stressing the number of months considering the average monthly volume, as to generate an average traded volume. By considering more data, a smoother, more stable output is expected to be retrieved, while by considering shorter periods of time, the output is expected to be more volatile.

The number of market files used have been stressed though time, from September 2019 up to June 2020. The rest of the model inputs have not been changed.

Graphs below show the output for 1, 3, 6, 9 y 12 Markit files generating the output through time. The month shown in the x-axis represents the execution date, i.e., the last month data.

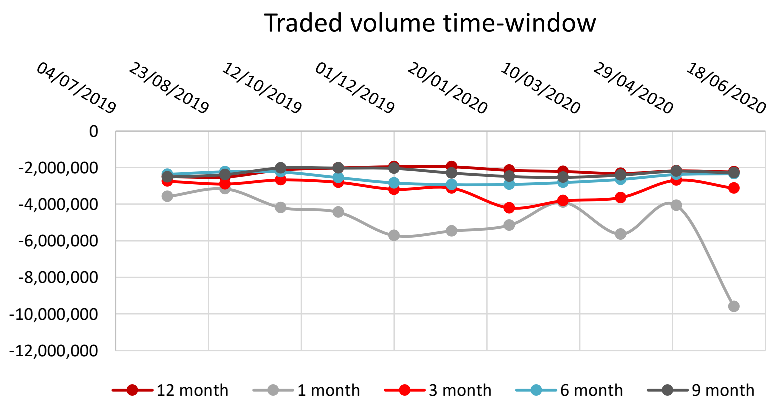


Figure 3: Traded volume time-window impact

It is to note how, as to compare the figures the most faithfully and for isolating the time-window effect, the minimum observation condition for calculating the average traded volume was discarded.

The output is observed to remain stable when decreasing the amount of used Markit files for determining the average traded volume, except for the one-month execution, which retrieves higher figures for almost every considered period. The reason behind this the amount of values which must be proxied when reducing the number of files. As the number of provided observations increase, the data is most likely to be modelled after its own data.

As to generate values covering a period representative enough, requiring using the least proxies possible, and as the output is seen to remain rather stable through time, the 12-month time span was finally chosen.

7.3 Model limitations, range of applicability and mitigation

The major difficulty to compute the AVA treated in this document is the lack of availability of comparable (simultaneous) market quotes from different market participants in order to obtain a probability distribution and/or percentiles of mid-market prices and bid-offer. This is partially overcoming in the proposed model by using proxies for all instruments with no available prices or not enough to determine the dispersion of prices.

Besides, the main model limitation at which the model as defined in model development date is that, due to the nature of the instruments and markets in which the model is developed, there is no unified data source for supporting the different assumptions and model inputs for the required parametrization.

Additionally, some assumptions such as the 100% market access for certain business units should be challenged periodically as to verify that this hypothesis remains true, in order to adequately determine this value.

8 MODEL MONITORING, USAGE AND CONTROL

This section collects a list of general ideas of monitoring and control, but the details of the exact policies, processes and controls will be included in the Model Implementation document.

8.1 Model monitoring and risk mitigation plan

In order to comply with Article 19 of EBA RTS, AVA methodological standard 49 and once the model is implemented in production after approval from the Internal Validation team, monitoring controls must be defined. Here are the controls suggested from the model developer point of view, without prejudice to further controls stablished by the user who will be also responsible to keep evidences of the control appliance in every exercise.

Regarding the concentrated positions identification methodology, reference *[18]* details the corporate procedure to follow as to identify these. The positions subject to the adjustment should be monitored periodically, as to guarantee no deviation from the identification standards.

The main input to be monitored would be the market access percentage. This parameter has been treated in several points of this document, and its relevance is once again highlighted. This parameter should be challenged annually, in order to verify that the unit's strategy remains so that the same market access percentage, or –for instance- if a desk loses the consideration of being a Market Maker, this parameter should be calibrated again.

Other relevant parameters which should be monitored are, for instance, the segmentation defined for the industry group categorization or the frequency with which the average traded volume will be updated. These parameters should be recalibrated periodically, at least annually, and the local risk user should ask for this information to FO, or to whom would have availability for retrieving this information.

These parameters should be provided by the FO data provisioning department, which in case of Boadilla, it is E-commerce. A procedure should be stablished where, periodically, Bloomberg reports as well as the number of subjacent references are queried. For the case of Boadilla unit, these reports are provided quarterly to the E-commerce department, and the number of references is provided on demand. The number of references should be updated at least annually if no significant change in the unit's strategy occurs, while the notional figures should be updated at least quarterly (in every AVA exercise).

Additional monitoring which should be performed -at least- in quarterly bases is guaranteeing that the model output is reasonable, and whether any unexpected results have been loaded in the output report. To do so, several processes could be considered.

- First, a historical tracking of the concentration AVA figures should be performed, in order to check that possible changes are consistent with changes in the portfolios and/or a tendency change in the market.
- Periodically the generated buckets should be monitored, in order to verify that are suitable to explain the different dimensions.
- The error log should be reviewed to verify that no error has been detected through the execution of the model. This verification may be evaluated by reviewing the intermediate control outputs, where for instance, the user would be required to verify that the instruments within scope have been provided with all the required minimum data.

Any potential deterioration of the quality of the model inputs provided by Market Data and IPV teams are expected to be detected corrected at earlier steps by those teams.

In case of any incidence that makes unfeasible to do the calculation, the last concentration AVA correctly computed will be used until the incidence is fixed.

Finally, future plan for this concentration AVA tool will be the following:

- Finalizing the AVA automation project ensuring it complies with all the requirements stated along this document.

Analyze if it is necessary to define or implement any change based on the monitoring controls defined above.

8.2 Contingency plan

The potential usage-related issues that have been identified are the following:

- Unavailability of market data: if information is erroneous or market liquidity become scarce. If the issue is due to changes in the markets, Market Risk team will discuss with the business on this matter to analyze the causes. If there is no available market data information for the affected period or it is considered erroneous, but it is considered an exceptional situation, Market Risk team will try to fix it and if not possible the best estimation for the last period would be used.
- The program or the infrastructure for the calculation of valuation adjustments is not accessible or not available. If for any reason it happens, the last period calculation will be used for all purposes.

8.3 Governance

All aspects regarding the governance of the FVA & AVA models are described in the "*Determination of Valuation Adjustments" procedure [6] and "Determination of Prudent Valuation Adjustments" procedure*" *[7]*.

9 REFERENCES

[1]Fair_Value_Adjustments_Methodological Standards_v3, Market Risk Methodology, May 2018

[2]Additional Value Adjustments (AVA) _ Methodological Standards, Market Risk Methodology, Nov 2018

[3]IFRS 13 Fair Value measurement, International Accounting Standards Board, May 2011

[4]Regulation (EU) No 575/2013 (Capital Requirements Regulation — CRR)

[5]EBA-RTS-2014-06 on Prudent Valuation, European Banking Authority, Jan 2015.

[6] Determination of Valuation Adjustments procedure, Corporate Market Risk, Sep 17

[7] Determination of Prudent Valuation Adjustments procedure, Corporate Market Risk, Feb 17

[8] Documentation requirements for FVAs, Internal Validation Team, 2018.

[9] "IPV_sep18", IPV Team, Jun 19

[10] "Santander_Zero FVA and AVA CoC Positions_v4.docx", Market Risk Methodology, Jun 19

[11] "MRAV_5001_MIXLS_SP_MPU June 2018.docx", Riesgos de Mercado, Global Markets Boadilla, Riesgos SCIB, Jun 2018

[12] "Manual Datos de Mercado v12.2.pdf", Riesgos de Mercado, Global Markets Boadilla, Riesgos SCIB

[13] Santander GCB. "Concentration Risk PVA".

[14] F. Caccioli, J.P. Bouchaud, J.D. Farmer. "A proposal for impact-adjusted valuation: Critical leverage and execution risk".

[15] B. Tóth et all. "Anomalous price impact and the critical nature of liquidity in financial markets".

[16] R. Almgren et all, "Direct estimation of equity market impact", Risk,18.

[17] E. Moro, et all, "Market impact and trading profile of hidden orders in stock markets", Physical Review.

[18] Corporation "*Concentrated Positions AVA*".

10 CHANGE CONTROL

Version	Owner	Changed by	Date of change	Validated by	Committee approval	Approval date	Scheduled review date
1	Pablo Blanco	Ignacio Hoyos	12/07/2020	Elena Lopez		16/07/2021	
2	Pablo Blanco	Ignacio Hoyos	03/01/2022				

Version	Description of change
1	Initial version
2	a) Issuer proxy included for average traded volume inference b) Marginal distribution allowed per category/level c) Manual input file included with additional parametrization options

11 APPENDIX I: MID AND SPREAD VOLATILITY STUDY

The following section proves how the mid-price volatility is much higher than the spread's volatility, which implies that the prices could move considerably, as the mid-price varies through time, while the bid-offer spread remains more stable.

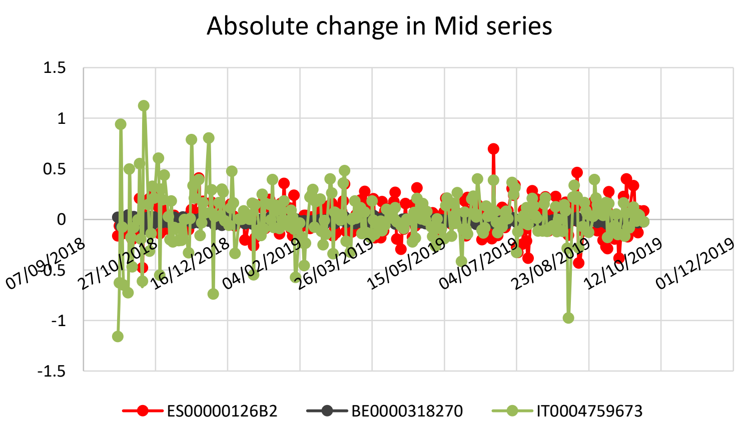
The study has been performed only for several fixed income products, like bonds. For ABS, as the portfolio is much less representative and the data availability in terms of bid-ask for these instruments is much limited and in fact, bid prices are always the reference.

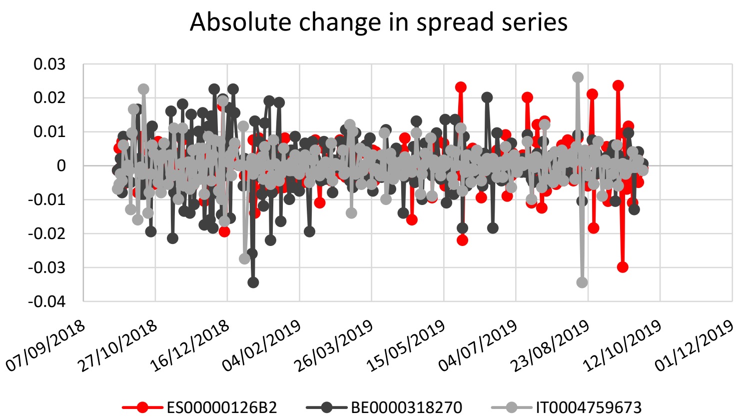
In this study, the evolution of the price for a series of days has been considered, and the mid-price as well as the spread has been tracked in a one year time-window for three representative bonds of the portfolio as of 31/12/2019, these being instruments with ISINs ES00000126B2, BE0000318270 and IT0004759673. These bonds are three of the greatest bonds in terms of notional, and therefore are expected to be of the most representative of the portfolio behavior. These three ISIN represent a 3% of the total portfolio notional, and are instruments with a maturity over one year, required for having enough data for performing this exercise.

For the comparison of the variation of the series, absolute changes in the price in absolute terms have been considered. The reason for this is that, in the proposed model, the variation in absolute terms of the price could entail significant changes in the output, and variations in absolute terms are considered as to avoid the netting effect of positive and negative changes in the output values. Therefore, once the mid and spread series have been provided, the absolute change by day has been calculated, and the average value of each series per ISIN has been calculated, and is shown below, together with the series for each value. It can be checked that the changes in the mid-prices are much more relevant than the changes in the size of the bid-ask spreads.

ISIN	Average mid change	Average spread change
ES00000126B2	11.860%	0.000%
BE0000318270	2.052%	-0.004%
IT0004759673	17.581%	-0.011%

Table 28: Mid and spread absolute average change per ISIN





Additionally, the standard deviation and the correlation among series is presented in the table below. It is clear that mid-prices are much more volatile than spreads and also that the correlation between them is low. Therefore, the conclusion is that a movement down or up in the mid-price not necessarily imply an increase or a decrease in the size of the spread and that any variation in the size of the spread will be negligible compared with the mid-price variation. This is the expected behavior in a liquid market, where the effect of any oversell or overbuy is rapidly captured for both the bid and the ask prices offered.

ISIN	Std mid variation	Std spread variation	Correlation
ES00000126B2	1.748%	0.013%	2.664%
BE0000318270	1.201%	0.028%	-0.160%
IT0004759673	1.242%	0.013%	14.889%

Table 29: Mid and spread absolute change standard deviation and correlation per ISIN

12 APPENDIX II: MARKIT DEFINITION

The following files contain TOTEM Markit's field definition, containing the detail for every data within the report.

Santander_N1600.pdf MIGR_27261 (_Santander_ANTSCOI

The main fields used as of model development date, and the definition provided by Markit, are,

- **ISIN**: Instrument ISIN identifier
- **STL Sum Nom Amt USD**: Sum of nominal amount of settlement instructions generated from standard settlement instructions for the last 30 days in USD.
- **TRP Sum Nom Amt USD**: Sum of nominal amount of settlement instructions generated from collateral management activity for the last 30 days in USD.

13 APPENDIX III: PROXY CALIBRATION INSTRUMENT POOL DESCRIPTION

As stated through the document, the following appendix details the depth of each proxy bucket after the AC loaded instruments it is generated after. For bonds, this information is presented in table below for average traded volume inferencing.

Rating	Maturity	Industry goup	Region	AC ISIN count
AAA to A	3Y <= t <= 7Y	Cover_Bond	Europe	1
			Others	1
		Financial Institutions	Europe	43
		Governments	North America	9
		Governments EUR	Europe	1
			Others	1
		Others	Europe	1
			North America	2
			Others	24
		SPGB	Europe	1
	t < 3Y	Financial Institutions	Europe	10
		Governments	North America	1
		Governments EUR	Others	1
		Others	Others	14
	t > 7Y	Cover_Bond	Europe	10
		Financial Institutions	Europe	12
		Governments	LATAM	1
			North America	6
		Governments EUR	Europe	4
			Others	3
		Others	Europe	2
			North America	5
			Others	4
		SPGB	Europe	1
BBB to B	3Y <= t <= 7Y	Financial Institutions	Europe	11
			LATAM	1
			North America	2
		Others	Europe	6
			LATAM	3
			North America	3
		SPGB	Europe	4
	t < 3Y	Financial Institutions	Europe	3
			North America	1
		Governments EUR	Europe	5
		Others	North America	2
			Others	1
		SPGB	Europe	4

Rating	Maturity	Industry goup	Region	AC ISIN count
	t > 7Y	Financial Institutions	Europe	16
			LATAM	4
			North America	1
		Governments	LATAM	7
		Governments EUR	Europe	1
			LATAM	2
		Others	Europe	20
			LATAM	8
			North America	4
		SPGB	Europe	3
CCC to D	3Y <= t <= 7Y	Others	LATAM	3
	t < 3Y	Governments	LATAM	1
		Others	LATAM	1
	t > 7Y	Others	LATAM	3

Table 29: Loaded bonds in AC conforming the bond average traded volume proxy at maximum disaggregation level

For bond volatility inferencing, table below is presented:

Rating	Maturity	Industry goup	Region	AC ISIN count
AAA to A	3Y <= t <= 7Y	Cover_Bond	Europe	175
			North America	17
			Others	21
		Financial Institutions	Europe	113
			LATAM	1
			North America	12
			Others	6
		Governments	Europe	7
			LATAM	1
			North America	13
			Others	1
		Governments EUR	Europe	42
			LATAM	2
			Others	18
		Others	Europe	37
			LATAM	2
			North America	36
			Others	39
		SPGB	Europe	10
	t < 3Y	Cover_Bond	Europe	100
			North America	10
			Others	19
		Financial Institutions	Europe	53
			LATAM	1
			North America	6
			Others	2
		Governments	Europe	3
			LATAM	2
			North America	2
		Governments EUR	Europe	18
			Others	6
		Others	Europe	19
			North America	3

Rating	Maturity	Industry goup	Region	AC ISIN count
			Others	21
		SPGB	Europe	3
	t > 7Y	Cover_Bond	Europe	56
	t > 7Y	Cover_Bond	Others	1
	t > 7Y	Financial Institutions	Europe	24
	t > 7Y	Financial Institutions	North America	2
	t > 7Y	Financial Institutions	Others	4
	t > 7Y	Governments	Europe	21
	t > 7Y	Governments	LATAM	6
	t > 7Y	Governments	North America	8
	t > 7Y	Governments EUR	Europe	48
	t > 7Y	Governments EUR	LATAM	3
	t > 7Y	Governments EUR	Others	20
	t > 7Y	Others	Europe	16
	t > 7Y	Others	LATAM	19
	t > 7Y	Others	North America	13
	t > 7Y	Others	Others	28
	t > 7Y	SPGB	Europe	11
BBB to B	3Y <= t <= 7Y	Cover_Bond	Europe	5
BBB to B	3Y <= t <= 7Y	Financial Institutions	Europe	144
BBB to B	3Y <= t <= 7Y	Financial Institutions	LATAM	24
BBB to B	3Y <= t <= 7Y	Financial Institutions	North America	28
BBB to B	3Y <= t <= 7Y	Financial Institutions	Others	2
BBB to B	3Y <= t <= 7Y	Governments	LATAM	26
BBB to B	3Y <= t <= 7Y	Governments EUR	Europe	11
BBB to B	3Y <= t <= 7Y	Governments EUR	LATAM	5
BBB to B	3Y <= t <= 7Y	Governments EUR	Others	1
BBB to B	3Y <= t <= 7Y	Others	Europe	184
BBB to B	3Y <= t <= 7Y	Others	LATAM	80
BBB to B	3Y <= t <= 7Y	Others	North America	45
BBB to B	3Y <= t <= 7Y	Others	Others	10
BBB to B	3Y <= t <= 7Y	SPGB	Europe	63
BBB to B	t < 3Y	Cover_Bond	Europe	4
BBB to B	t < 3Y	Financial Institutions	Europe	48
BBB to B	t < 3Y	Financial Institutions	LATAM	2
BBB to B	t < 3Y	Financial Institutions	North America	19
BBB to B	t < 3Y	Financial Institutions	Others	1
BBB to B	t < 3Y	Governments	LATAM	2
BBB to B	t < 3Y	Governments	Others	1
BBB to B	t < 3Y	Governments EUR	Europe	18
BBB to B	t < 3Y	Governments EUR	LATAM	1
BBB to B	t < 3Y	Others	Europe	70
BBB to B	t < 3Y	Others	LATAM	12
BBB to B	t < 3Y	Others	North America	27
BBB to B	t < 3Y	Others	Others	2
BBB to B	t < 3Y	SPGB	Europe	34
BBB to B	t > 7Y	Cover_Bond	Europe	1
BBB to B	t > 7Y	Financial Institutions	Europe	127
BBB to B	t > 7Y	Financial Institutions	LATAM	25
BBB to B	t > 7Y	Financial Institutions	North America	7
BBB to B	t > 7Y	Financial Institutions	Others	1
BBB to B	t > 7Y	Governments	LATAM	72
BBB to B	t > 7Y	Governments	Others	3
BBB to B	t > 7Y	Governments EUR	Europe	12
BBB to B	t > 7Y	Governments EUR	LATAM	10

Rating	Maturity	Industry goup	Region	AC ISIN count
			Others	7
		Others	Europe	113
			LATAM	97
			North America	21
			Others	13
		SPGB	Europe	87
CCC to D	3Y <= t <= 7Y	Financial Institutions	LATAM	1
		Governments	LATAM	4
		Governments EUR	LATAM	1
		Others	Europe	1
			LATAM	12
	t < 3Y	Governments	LATAM	3
		Others	LATAM	4
	t > 7Y	Financial Institutions	Europe	1
			LATAM	2
		Governments	LATAM	12
		Governments EUR	LATAM	5
		Others	LATAM	5

Table 30: Loaded ABS in AC conforming the bond volatility proxy at maximum disaggregation level

Analogously, for ABS the following table presents the instruments conforming each bucket proxy. For proxying the average traded volume, the ISIN per bucket are the following:

Rating	Intrument type	AC ISIN count
AAA to A	ABS	14
	LL	149
	SME	1
	Whole Loan	49
CCC to D	ABS	4
	LL	11
	Whole Loan	2

Table 31: Loaded ABS in AC conforming the ABS average traded volume proxy at maximum disaggregation level

And regarding the volatility proxy, the table below summarizes the used instruments per bucket.

Rating	Intrument type	AC ISIN count
AAA to A	ABS	8
	LL	43
	Whole Loan	5
CCC to D	ABS	4
	LL	5
	Whole Loan	2

Table 32: Loaded ABS in AC conforming the ABS volatility proxy at maximum disaggregation level