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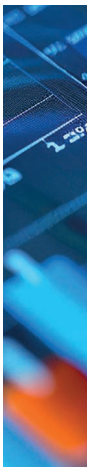
SOLVENCY II REVIEW

# ANIA's proposal for a realistic assessment of the **Risk Correction of the Volatility Adjustment**



SOLVENCY II REVIEW

# ANIA's proposal for a realistic assessment of the **Risk Correction of the Volatility Adjustment**

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*The review of Solvency II represents a key opportunity for policymakers to deliver on the important European objectives set out in the Green Deal and the Capital Markets Union and also to pursue the reduction of undue requirements and constraints that may hamper long-term investments.*

*The Volatility Adjustment is an essential tool in Solvency II that should help reconcile the insurer's long-term view with the mark to market approach adopted in Solvency II, sterilizing the negative effects of short-term market fluctuations of assets and preventing procyclical investment behaviour.*

*The current review process has modified the Volatility Adjustment structure, aiming to correct some of the shortcomings of the current formula, but unfortunately some other envisaged modifications such as the ones relating the Risk Correction could, if wrongly calibrated, erode other beneficial effects introduced by the review process.*

*The proposed methodology aims to contribute to the Level 2 technical discussion around the calibration of the Risk Correction mechanism in the Volatility Adjustment; its' structure should be based on evidence-based inputs, use reliable and adequate real-world data and represent a realistic assessment of expected losses, unexpected credit risk or any other risk.*

# 1. Introduction

Solvency II is regarded to be a highly sophisticated prudential framework, but it is also considered among the most conservative frameworks in the world, creating unnecessary costs and barriers, which have a significant impact on insurers ability to make long-term investments in the economy and offer long-term products.

*As Europe's largest institutional investors, insurers have the financial strength to provide widespread benefits for the economy, acting in a countercyclical manner and investing with a sustainable, long-term perspective. Absolving important functions in the long term, risk management and regulatory requirements are elements of the framework to which insurance companies are particularly exposed to; procyclical elements in capital requirements, for example, would be especially harmful for players who operate their business model with the opposite logic. This is why Solvency II, since its inception, has been equipped with a set of measures aimed at sterilizing short term effects from insurers' capital requirements.*

**The review of Solvency II represents a key opportunity for policymakers to deliver on the important European objectives set out in the Green Deal and the Capital Markets Union**, as well as support the Next Generation EU plans for the social and economic recovery of Europe. Insurers could i) maintain their role as providers of long-term savings/pension products, which are key for the long-term well-being of European citizens, especially in light of ageing populations, and strained national budgets; ii) provide protection to individuals and businesses, and working with governments to close the protection gap, currently considered of paramount importance, given the challenges posed by climate change and iii) invest in the European economy, supporting the post-Covid-19 recovery and the transition to a sustainable economy.

As a consequence, **the future regulatory framework should also pursue the reduction of undue requirements and constraints that may hamper long-term investments**; this can be achieved via amendments which should deliver a realistic reflection of insurers' real risk, be aimed at mitigating artificial volatility when it comes to regulatory capital, and safeguard, at the same time, the key objectives this legislation is aimed at, namely providing for equivalent protection for policyholders as well as robust prudential treatment in the interest of financial stability.

*On December 13th, the European Parliament and the Council, with the active support of the Commission, has reached an agreement on the text regarding the Solvency II Review proposal. The text was provisionally approved by the plenary of the European Parliament on April 22nd.*

The text is the result of the political agreement reached in the Trilogue phase that began in September on the texts approved in Parliament (on July 18th, 2023) and in the Council (on June 17th, 2023). It aims at introducing an extensive number of regulatory changes to better reflect existing and upcoming risks; examples of this are the modifications to Long-Term Guarantee (LTG) measures, on the one hand, and the introduction of requirements related to newly identified risks such as sustainability risks, liquidity risks and negative interest rate risk, on the other.

*The compromise text also shows the intention, and bears the potential, to pursue the objective of reducing undue requirements, especially those embedded in the Long-Term Guarantee measures such as the Volatility Adjustment (VA) and the Risk Margin.*
*However, to deliver on the co-legislators' ambitions for the review of Solvency II, it is imperative that the Commission's work on second-level measures takes into account the Parliament's concerns on EIOPA's proposed calibrations which could undermine this potential.*

**As a matter of fact, the effective ability of the new framework to overcome undue and procyclical requirements, is not to be taken for granted**. The second-level measures are crucial to weighing the technical aspects of the Directive in detail.

Among LTG measures, the Volatility Adjustment has been deeply revised to make it more sensitive to market fluctuations and to better capture spread movements in single markets; an improvement in this perspective, has been deemed to be largely needed by both industry and regulators. This is why the General Application Ratio has been increased from 65 to 85 percent, the Credit Spread Sensitivity Ratio (CSSR) and an (optional) adjustment aimed at mitigating overshooting effects, both undertaking specific, have been introduced, and a new, much better working, Macroprudential Component has been designed (to capture single market spread movements).

*Unfortunately, despite the lack of evidence to justify a change in the current methodology – which is currently based on long-term statistics - and after a long pushback by the industry, the structure of an important element of the VA - the Risk Correction (RC) - has been changed by the European Commission, with a new methodology originally proposed by EIOPA which will make it highly dependent on short-term market fluctuations, thus undermining the countercyclical nature of the VA.*

However, very importantly, pushed by strong European Parliament's concerns about the procyclicality and balance sheet volatility introduced by the mechanism designed by EIOPA, **the final political agreement introduced a cap linked to long-term average spreads (LTAS)** in this calculation, **to act as a safeguard measure when spreads undergo turbulent periods**.

The agreement is intended to reach a compromise between what has been considered to represent a too punitive and dangerously procyclical methodology (the new Risk Correction, depending on current spreads) and a methodology which was not deemed to be sufficiently conservative (the current Risk Correction, depending only on long-term average spreads).

The calibration of the cap and of the other parameters of the Risk Correction are part of second-level measures work; according to the agreement, the cap should be "appropriate" and therefore calibrated as "a realistic assessment of expected losses, unexpected credit risk or any other risk", as the other elements of the Risk Correction methodology.

**Despite this**, on May 15th in a non-paper to the Expert Group on Banking, Payments and Insurance (EGBPI) aimed at supporting the discussion with experts, **the Commission has put forward some initial calibrations of the Risk Correction parameters that do not reflect at all the spirit of the agreement**.

The cap discussed during the first EGBPI meeting (195% of LTAS for corporate bonds and 105% of LTAS for government bonds) would have no impact, even in the most extreme market environments, and would re-introduce volatility and procyclicality, undermining the other agreed improvements to the VA as insurers would be de facto be always forced to calculate the Risk Correction as a percentage of current spreads.

Furthermore, this proposal introduces inconsistency within the Solvency II framework, particularly regarding the treatment of downgrade and default risks under the Matching Adjustment (MA), which is still calibrated to be equal to 35% of LTAS for corporates and 30% of LTAS for government bonds. This inconsistency could lead to disparate requirements for insurers with similar portfolios, undermining regulatory coherence. For example, a VA-user investing in corporate bonds would have to reserve up to 195% of the LTAS to reflect the default risk of a corporate bond whereas a MA-user would only have to reserve 35% of the LTAS.

**The new Risk Correction parameters should be calibrated using real-world data on expected losses, unexpected credit risk or any other risk based on historical evidence**. This means that the starting point of the calibration work should be to technically substantiate the cap, which will in turn define percentages associated to the three scenarios envisaged by the agreement.

The work of the Commission should, therefore, be based on a suitable time series span of credit spreads from including all relevant crisis events for European insurance companies **and take into account how procyclicality should be kept at a minimum in favour of a stable and well calibrated mechanism able not to bias insurers investment strategies**.

*In the following sections we focus on changes introduced to the Volatility Adjustment structure and on a proposal aimed at contributing to the technical discussion around the calibration of the risk correction mechanism embedded in its overall structure.*

# 2. The Volatility Adjustment: several modifications contribute to a new structure

*The Volatility Adjustment is an essential tool in Solvency II; it should help reconcile the insurer's long-term view with the mark to market approach adopted in Solvency II, sterilizing the negative effects of short-term market fluctuations of assets and preventing procyclical investment behaviour.*

**The VA should act as an anticyclical adjustment** which should stabilize SCR and Own Funds fluctuations, providing the right incentives for insurance companies' investment strategies. The Solvency II regime should therefore not, because of measurement flaws which do not currently reflect the real underlying risks and business model, create artificial incentives which would inhibit their ability to play a countercyclical role.

As known, insurers invest significantly in both government and corporate bonds, an asset class chosen by the insurer to match the characteristics of their liabilities, notably their duration and the insurer's risk appetite. In aggregate, the payments from the bonds, i.e. the coupons and redemption proceeds will be used to pay the liabilities as they fall due.

**Because insurers can typically manage their overall liabilities and claims at aggregate portfolio level together with their aggregate asset portfolio, short-term fluctuations in the market value of the bonds do not impair its ability to pay the liabilities** (as the bonds will still pay the same coupon and redemption payments despite a change in the market price). It is when a bond defaults that the insurer will be impacted. This ability to manage assets and liabilities together and focus on cashflows rather than temporary market value changes is a core feature of the insurer's long-term business model.

*The methodology currently used to calculate VA is based on a so-called European reference portfolio, as defined by the European Insurance and Occupational Pensions Authority (EIOPA). The VA is based on the spread between the interest rate that could be earned from assets included in a reference portfolio for that currency and the rates of the relevant basic risk-free interest rate term structure for that currency, reduced by the portion of that spread that is attributable to a realistic assessment of expected losses or unexpected credit or other risk of the assets (i.e., the "Risk Correction").*

This implies that companies investing in portfolios riskier than the EIOPA reference portfolio are exposed to undershooting effects (i.e. the VA does not compensate market fluctuations, reducing liabilities much less than assets, causing huge SCR and Own Funds fluctuations), while companies investing in higher quality portfolios (i.e. portfolios less risky than the EIOPA reference portfolio) are exposed to overshooting effects (i.e. the VA overcompensates, reducing liabilities more than assets, causing undue SCR or Own Funds improvements).

**Solvency II has entered into force in 2016, and as of today, it has not been witnessed how fundamental this tool can be when it comes to financial crisis spread movements**. Although there has been some spread widening during the Covid-19 crisis, it has not been nowhere near the amplitude witnessed during the 2008 and the 2011 crisis. Despite this, the financial market turbulence caused by Covid-19 has shown that it is even more important than previously thought to have effective stabilizing elements in the Solvency II regime.

*The current review process has modified the Volatility Adjustment structure, aiming to correct some of the shortcomings of the current formula, such as not considering assets other than bonds in the portfolio or adjusting the activation conditions for country specific adjustments, but unfortunately some other envisaged modifications have the power to turn tables around and erode the beneficial effects of the above-mentioned improvements.*

The agreed text introduces, in fact, a change of paradigm backing the philosophy around which the Risk Correction is defined, which has been delinked from long-term average spreads and made dependent from current spreads. In particular, the following paragraph will be added under the Article 77d of Solvency II Directive:

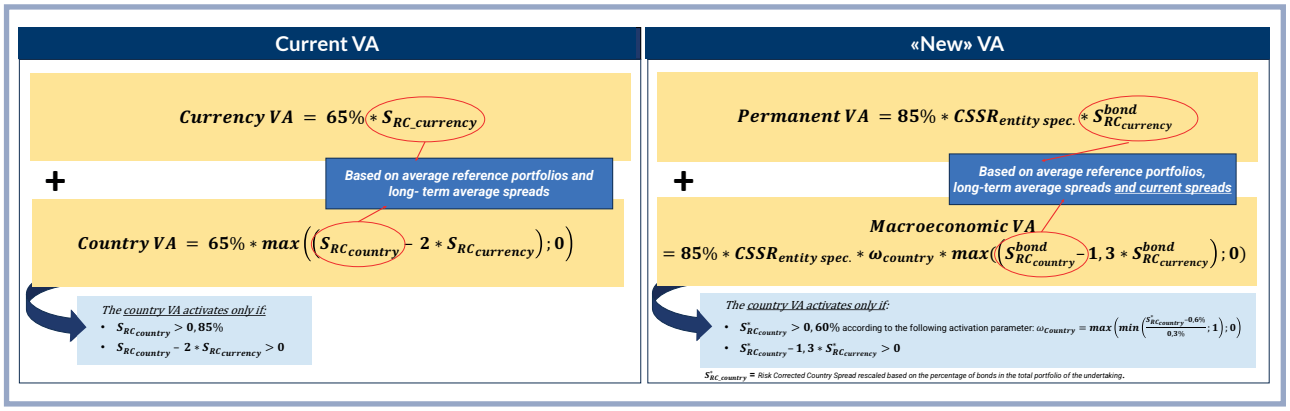
*The portion of the spread that is attributable to a realistic assessment of expected losses, unexpected credit risk or any other risk shall be calculated as a percentage of spreads. That percentage shall decrease as spreads increase and shall at least differentiate the following three cases: (a) Where spreads do not exceed their long-term average; (b) Where spreads exceed their long-term average but do not exceed twice their long-term average; (c) Where spreads exceed twice their long-term average. The Risk Correction shall never exceed an appropriate percentage of the long-term average spreads.*

**The Risk Correction** adjusts the Volatility Adjustment for "a realistic assessment of expected losses or unexpected credit or other risk of the assets". In other words, it **ensures that the insurer does not take credit for income that it does not expect to receive from the bond portfolio**. As discussed above, this is the expected losses due to defaults.

*Designing a Risk Correction which is dependent on current spreads, which in other words is "on short-term market fluctuations", introduces a strong procyclical element in a measure which should be anticyclical by nature.*

Figure 1 and Table 1 summarize the changes introduced by the political agreement on the Volatility Adjustment reached on December 13th.

## Fig. 1: Current VA vs. "new" VA formula




## Table 1: Summary of the modifications agreed on December 13th involving the VA

| | Current method (Dir.2009/138/CE) | Method agreed in Trilogue | Impact |
|---|---|---|---|
| **Reference portfolio and spread calculation** | Reference portfolio consisting of bonds, securitizations, loans, equities, real estate. Spread (with respect to the risk-free-rate curve) calculated as a weighted average of spreads for corporate and government debt instruments (by currency and country, respectively). | Removal of equities and real estate from the reference portfolio (based, therefore, only on bonds) (i.e. government and corporate bonds exposures percentages now summing to 100%). Unchanged approach for spread calculation. | Positive |
| **Risk Correction** | Based on default probabilities of bonds in portfolio and long-term averages ("fundamental spread"). | Amendment to the methodology for the calculation of the Risk Correction to include dependence on the value of current spreads in three different scenarios and to introduce a cap calculated as a percentage of long-term averages (details in Level 2). | Extremely Negative, potential mitigation if an effective and realistic cap is defined by Level 2 Delegated Acts. |
| **"Country" component (macro-VA)** | Country specific component dependent on an absolute threshold (85 bps) and a relative threshold (2X) (excess of country spread with respect to the currency one). | Amendment to activation conditions for the national component of the VA (now called "macroeconomic component"): "omega factor" for a "gradual" activation and reduced relative threshold (1.3X). | Positive |
| **General Application Ratio (GAR)** | 65% | Increased from 65% to 85% | Judgment based on the combination of the three multiplicative ratios, depending on entity-specific results. |
| **Credit Spread Sensitivity Ratio (CSSR)** | Missing | Introduction of a multiplicative country-specific factor based on asset portfolios' duration (details in Level 2 measures). | |
| **Undertaking specific adjustment for overshooting** | Missing | Introduction of a multiplicative adjustment that takes into account the "distance" - in terms of risk-corrected spreads - of the company's portfolio compared to the average European portfolio. Optional but subject to approval by the national supervisory authority, with a cap at 105% and application conditions. | |

**To allow the VA to work efficiently, the impact of all changes should lead to a justified and needed reduction in capital requirements and volatility.**

*As a matter of fact, the industry only supports improvements to the Volatility Adjustment resulting in the following outcomes:*

- *a general increase in the level of the VA to properly reflect the ability of insurers to earn returns above risk-free rates;*
- *an increased mitigation of artificial balance sheet volatility.*

# 3. The new Risk Correction Methodology: a technical contribution

In this section, we outline an **exercise aimed at proposing an appropriate methodology to calibrate the cap based on real-life market data**, providing evidence-based inputs to obtain a realistic and prudent calibration of an appropriate cap to the Risk Correction methodology.

**We also propose some technical considerations to support an appropriate calibration for the percentages to be applied to the spreads** to be considered in the three cases established under the proposed regulation.

According to the agreed EC's proposal, the Risk Correction would now be defined by the following formula:

$$RC_{corp} = min(I_g\% * min(S_c, LTAS_c) + II_g\% * max[0, min(S_c - LTAS_c, LTAS_c)] + III_g\% * max(S_c - 2 * LTAS_c, 0); CAP_g\% * LTAS_c)$$

$$RC_{gov} = min(I_c\% * min(S_g, LTAS_g) + II_c\% * max[0, min(S_g - LTAS_g, LTAS_g)] + III_c\% * max(S_g - 2 * LTAS_g, 0); CAP_c * LTAS_g)$$

$S_{g/c}$ = spread of the IER of the reference portfolio (currency or country) over the risk-free curve (for government or corporate bonds)

$LTAS_{g/c}$ = long-term average spread of $S_{g/c}$ (over 30 years, on a daily basis)

The structure of the formula follows the above-cited article 77d, which means that the Risk Correction should be such that:

- depends on three percentages (different for corporate and government bonds) to be applied in three different scenarios according to when spreads are: i) lower than LTAS, ii) higher than LTAS but lower than twice the latter; iii) higher than twice the LTAS.
- is never higher than a cap expressed in term of long-term average spreads (different for corporate and government bonds).

Moreover, in order for the Risk Correction formula to be consistent, the percentages should decrease as the spread increase and should be such that the percentages related to the first two tiers are not higher than the one related to the cap.

As underlined in the above section, an appropriate calibration of the Risk Correction and, therefore, of a reasonable cap expressed in terms of long-term averages spreads (LTAS) and consistent percentages associated to the three tiers, should be based on historical evidence and on a "realistic assessment of expected losses, unexpected credit risk or any other risk".

According to our analysis, **observed data on corporate market spreads** including the most severe crisis periods experienced by European insurance companies and based on EIOPA's reference portfolios **would justify the following calibrations**:

**For corporate bonds:**

- *CAP% = 60%*
- *percentages to be determined coherently with the cap (for example, 30%, 20%,10%)*

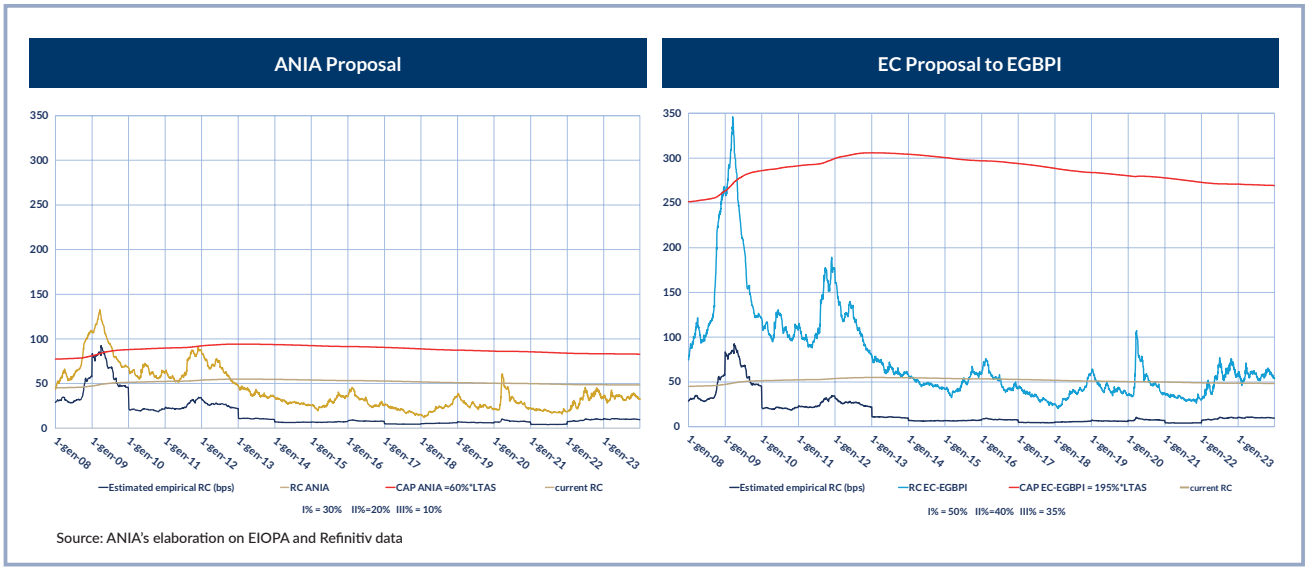
As empirical evidence on transitions matrices **for government bonds** is limited, **historical evidence would suggest applying lower percentages** to the Risk Correction related to them.

**For government bonds:**

- *CAP% = 40%*
- *percentages to be determined coherently with the cap (for example, 20%, 15%,5%)*

The graphs reported below show how important it is to define a realistic and evidence-based cap which would be able to act also on the calibration of the 3-tier percentages; this would lead to a more stable and anticyclical risk correction also on a daily basis and, therefore, to a more stable and anticyclical VA.

**Fig. 2: A comparison of ANIA vs. EC/EGBPI proposals (focus on corporate bonds)**




Source: ANIA's elaboration on EIOPA and Refinitiv data

Our analysis starts from noting that **neither EIOPA, nor the Commission has provided any robust evidence to substantiate the proposal**.

The "evidence" put forward by EIOPA to justify a change to the Risk Correction was based on BB-rated bonds, which represent approximately 2% of insurers' investments, and focused on spread changes and not on defaults occurred historically.

Moreover, the academic paper used as a starting point of the calibration work done by EIOPA in its 2020 Opinion to define the percentages associated to the two (now three) scenarios envisaged by the agreement, which indirectly would impact the value of the cap is – in our opinion - unsuitable for the purpose for several reasons.

Despite being misleading to start the calibration work taking as a reference point a methodology that does not envisage several elements of the Risk Correction agreed in the trilogue negotiations, such as a third scenario and a cap, from a technical point of view, the proposed percentages were calibrated starting from the conclusion of Giesecke et al. (2011)[1], a paper published in a prestigious journal but which does not fit with the purpose of this calibration.

In particular, referring to the paper:

- it posited, perhaps correctly, that credit spreads are not reliable predictors of defaults. In fact, authors state that there is no evidence that credit spreads respond to current default rates; it contradicts even the idea of a Risk Correction proportionated to the credit spread;
- considered only non-financial corporate bonds (including those of a very small amount and not listed) issued in the US from 1866-2008, thus analysing a portfolio potentially much riskier than the "insurance reference portfolio".

On the contrary, **we believe that the calibration should be based at least on** the following element, which are now not taken into account by the proposal discussed in the EGBPI meeting:

- **credit spreads from the EIOPA reference portfolios**;
- **a suitable time series span** which includes all relevant crisis event for European insurance companies.

These are the reasons why, taking into account real world statistics on defaults and rating transitions as a reference, the proposed approach is based on the following inputs:

[1] K. Giesecke, F. Longstaff, S. Schaefer, I. Strebulaev, 2011. Corporate Bond Default Risk: A 150-Year Perspective. Journal of Financial Economics, 102(2), 233-250. "*We study corporate bond default rates using an extensive new data set spanning the 1866–2008 period. We find that the corporate bond market has repeatedly suffered clustered default events much worse than those experienced during the Great Depression. For example, during the railroad crisis of 1873–1875, total defaults amounted to 36% of the par value of the entire corporate bond market. Using a regime-switching model, we examine the extent to which default rates can be forecast by financial and macroeconomic variables. We find that stock returns, stock return volatility, and changes in GDP are strong predictors of default rates. Surprisingly, however, credit spreads are not. Over the long term, credit spreads are roughly twice as large as default losses, resulting in an average credit risk premium of about 80 basis points. We also find that credit spreads do not adjust in response to realized default rates.*"

i) time series regarding daily European market spreads and including the most important crisis event related to this market;

ii) most severe historical probabilities of defaults and rating transitions observed in the last decades;

iii) use of EIOPA's reference portfolio.

The **logic behind the approach** is therefore to:

- calibrate the percentage of the long-term average spreads acting as a cap (CAP%), based on historical evidence representing a realistic assessment of defaults and rating transitions rates;
- calibrate the 3-tier percentages, based on the historical data used to calibrate the cap and on the new definition of Risk Correction which states that these percentages decrease as spread increases.

Below is a **summary of the proposed methodological approach** (see Appendix for more details):

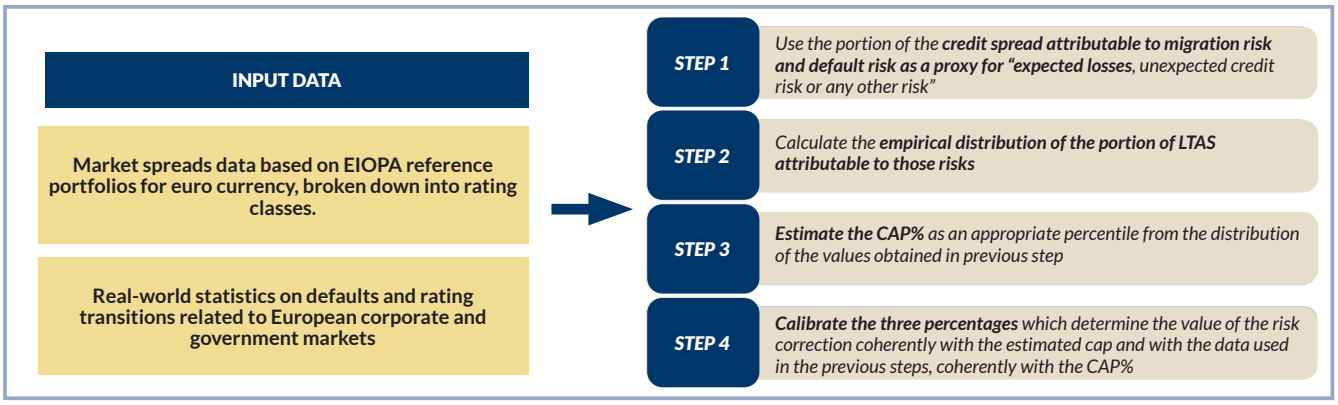
**Step 1**: estimate, from Jan-2008 to Dec-2023, the Risk Correction as the portion of the credit spread (based on EIOPA's reference portfolio) attributable to defaults and rating transition rates as a proxy for "expected losses, unexpected credit risk or any other risk" using the frequencies of defaults and rating transitions observed during 2009, following the financial turbulences triggered by the Lehman Brothers bankrupt (which have been identified as the most severe crisis in the last decades). The calculation is performed for each point in time along the whole time series considered.

**Step 2**: calculate the empirical distribution of the portion of LTAS attributable to those risks;

**Step 3**: estimate the CAP% as an appropriate percentile from the distribution of the values obtained in the previous step;

**Step 4**: calibrate the three percentages which determine the value of the Risk Correction coherently with the estimated cap and with the data used in the previous steps.

**Fig. 3: Summary of the proposed methodological approach:**



# 4. Appendix: An appropriate set of parameters to be used for calculating the Risk Correction of the Volatility Adjustment under the Solvency II Review

As underlined in the previous sections, the Solvency II legislative framework defines the Risk Correction as the amount credit spread the VA need to be adjusted to ensure that the insurer does not take credit for income that it does not expect to receive from the bond portfolio, and it should be based on "a realistic assessment of expected losses or unexpected credit or other risk of the assets".

The performed analysis was therefore aimed at collecting real world statistics on defaults and rating transitions related to European corporate and government bonds markets, including the most important crisis event related to these markets, and is based on European insurance companies' exposures, in order to obtain a solid and real-data driven calibration of the Risk Correction parameters.

The RCs arising from the proposed calibrations are the following:

$$RC_{corp} = min(30\% * min(S_c, LTAS_c) + 20\% * max[0, min(S_c - LTAS_c, LTAS_c)] + 10\% * max(S_c - 2 * LTAS_c, 0); 60\% * LTAS_c)$$

$$RC_{gov} = min(20\% * min(S_g, LTAS_g) + 15\% * max[0, min(S_g - LTAS_g, LTAS_g)] + 5\% * max(S_g - 2 * LTAS_g, 0); 40\% * LTAS_g)$$

$S_{g/c}$ = spread of the IER of the reference portfolio (currency or country) over the risk-free curve (for government or corporate bonds)

$LTAS_{g/c}$ = long-term average spread of $S_{g/c}$ (over 30 years, on a daily basis)

In table 2 are reported the details of the methodological approach and of the sources and assumptions.

### Step 1: **Estimation of the Risk Correction as a function of default and migration risk in a 1-year horizon**

The calculation is performed for each point in time, on a daily basis, **from Jan-2008 to Dec-2023**. In order to take into consideration real word rating migration and default frequencies at their historical maximum, research papers published by the three major rating agencies, Standard & Poor's (S&P), Moody's, Fitch, have been analysed to identify the most severe rating migration and default frequencies in the last decades. Based on this review, **frequencies observed during 2009** - i.e. those following the financial crisis triggered by the Lehman Brothers bankrupt - have been identified as the most severe in the last decades **and Moody's statistics have been identified as the most severe** among the three agencies. The matrix (Table 3) has been rescaled to exclude rating withdrawals[2] (for computational constraints) and upgrades (according to a prudent approach).

[2] When the agency no longer rates an entity, debt or financial obligation, debt issuance program, preferred share or other financial instrument for which it previously assigned a rating.

### Table 2: Summary of assumptions and data sources

| | Assumptions | Source for data | Rationale |
|---|---|---|---|
| **Data and portfolio** | Market data from January 2008 to December 2023, to include the most relevant crisis in the financial markets. | Refinitiv | The time series considered includes all the most relevant crisis event for the European insurance market. |
| | European insurance reference portfolios as of YE 2023 | EIOPA representative portfolios applicable end of March 2023. | The use of EIOPA portfolio is aimed at tailoring the assessment on the effective exposure of European insurance companies. Using data from different markets or not taking into account the real investment behaviour of European insurance companies could misestimate the risk. |
| **Rating migrations rates** | Annual global transition matrix for 2009 | Moody's | The 2009 Moody's matrix - i.e. the one following the financial turbulences triggered by the Lehman Brothers bankrupt - gives the most severe public statistics on defaults and migrations rates. |
| **Default rates** | Default Recovery Rate = 30% | EIOPA | In line with EIOPA assumption in the current PD calculation. |
| | Annual global transition matrix for 2009, as for rating migrations | Moody's | The 2009 Moody's matrix gives the most severe public statistics on defaults and migrations rates. |
| **Time-Horizon** | 1 year | - | The 1-year horizon approach provides a proxy for actual defaults but also for potential future losses arising from rating migrations. |

*Note: The assumptions presented have been selected after evaluating several options and approaches*

### Table 3: 1-year corporate transition matrix – Moody's 2009 (rescaled)

| | AAA | AA | A | BBB | BB | B | CCC | D |
|---|---|---|---|---|---|---|---|---|
| AAA | 64,90% | 35,10% | 0,00% | 0,00% | 0,00% | 0,00% | 0,00% | 0,00% |
| AA | 0,00% | 74,88% | 23,86% | 1,10% | 0,16% | 0,00% | 0,00% | 0,00% |
| A | 0,00% | 0,00% | 85,36% | 13,42% | 0,47% | 0,56% | 0,00% | 0,19% |
| BBB | 0,00% | 0,00% | 0,00% | 92,63% | 5,55% | 0,91% | 0,10% | 0,80% |
| BB | 0,00% | 0,00% | 0,00% | 0,00% | 80,86% | 15,00% | 1,53% | 2,61% |
| B | 0,00% | 0,00% | 0,00% | 0,00% | 0,00% | 76,62% | 15,55% | 7,84% |
| CCC | 0,00% | 0,00% | 0,00% | 0,00% | 0,00% | 0,00% | 66,24% | 33,76% |

Source: ANIA's elaboration on Moody's public available data

Transition matrices with 1-year time horizon have been considered as they provide a proxy for actual defaults but also potential future losses arising from rating migrations.

Let's denote by $P_i(X \rightarrow Y)$ the probability that the rating of a generic issuer migrates from rating $X$ to rating $Y$. In an analogous manner, let's denote by $P_i(X \rightarrow D)$ the probability that a generic issuer $i$ with rating X defaults. Let's assume also that $i = S, C$ where $S = Sovereign$ and $C = Corporate$.

For the scope of the analysis, data related to the EIOPA reference portfolios (financial and non-financial) for euro currency referring to year-end 2023 have been considered.

To **estimate the portion of the spread due to the rating migration risk**, we take into consideration a scenario in terms of credit spread related to the following rating classes: AAA, AA, A, BBB, BB, B, CCC.

Let's denote by $S_i^X(t)$ the realized credit spread observed at the time in relation to the issuer $i$ with rating $X$. The proposed approach to estimate the portion of the spread due to the rating migration risk consists in calculating the expected credit spread, under a 1-year time horizon calculated as a function of rating migration probabilities and credit spread scenario observed at time $t$.

The difference between the expected credit spread and the realized spread at time represents the portion of the credit spread attributable to the rating migration risk.

Let's denote with $\overline{M_i^X}(t)$ **the portion of the credit spread attributable to the rating migration risk for the issuer with rating** $x$. Such portion is calculated as follows,

$$\overline{M_i^X}(t) = \overline{S_i^X}(t) - S_i^X(t)$$

where:

$$\overline{S_i^X}(t) = -\ln\left(\frac{\sum_{j=AAA}^{CCC} P_i(X \to j) * \exp(-S_i^j(t))}{1 - P_i(X \to D)}\right)$$

is the credit spread expected in relation to the issuer $i$ with rating $X$ under the 1-year time horizon and it is calculated as a function of the price derived from realised credit spreads[3] - for the different rating classes – and the migration probabilities related to the initial rating $X$[4]. $\overline{M_i^X}(t)$ is then rescaled with respect to the initial credit spread $S_i^X(t)$ in order to obtain the portion of the initial credit spread reflecting migration risk (denoted with $M_i^X(t)$).

We denote with $M(t)$ the portion of the total portfolio credit spread obtained by weighting $M_i^X(t)$ for the EIOPA reference portfolio weights $W_i^X(t)$:

$$M(t) = \sum_{j=AAA}^{CCC} M_i^j(t) W_i^j(t)$$

To **estimate the portion of the spread due to the default risk**, we refer to the probabilities of default for each rating class as reported in the selected transition matrices.
Let's denote with $D_i^X(t)$ **the portion of the credit spread attributable to the default risk for the issuer** $i$ **with rating** $X$. Such portion is calculated as follows,

$$D_i^X(t) = -\ln[1 - P_i(X \to D)] \times LGD$$

where $LGD$ is the Loss Given Default calculated as,

$$LGD = 1 - RR$$

with $RR$ representing the recovery rate. We assume $RR = 30\%$ for both Sovereign and Corporate bonds, in line with EIOPA assumption in the current PD calculation.

[3] Exponential transformation is used for deriving prices from credit spreads.

[4] The denominator of the fraction considers the migration probabilities related to the rating excluding from the sum the probability of default related to the initial rating $X$.

We denote with $D(t)$ the portion of the total portfolio credit spread obtained by weighting $D_i^X(t)$ for the EIOPA reference portfolio weights $W_i^X(t)$:

$$D(t) = \sum_{j=AAA}^{CCC} D_i^j(t) W_i^j(t)$$

Once both portions of the spread due to rating migration and default have been quantified at each point in time for the entire portfolio, we **denote their sum with $RC(t)$ and assume it as a proxy for the Risk Correction at time t.**

$$RC(t) = M(t) + D(t)$$

Step 2: **Calculate the empirical distribution of the portion of LTAS attributable to migration and default risks**

After calculating $RC(t)$ for every point in time of the considered time series we obtain the **empirical distribution of the ratios between the Risk Correction and the Long-Term Average Spread** (LTAS), denoting such percentage with $RC_L(t)$:

$$RC_L(t) = \frac{M(t) + D(t)}{LTAS(t)} = \frac{RC(t)}{LTAS(t)}$$

Step 3: **Estimate the CAP% as an appropriate percentile from the distribution of the values obtained in previous step**

**The calibration of the CAP%** can be performed using different levels of percentile. It has been chosen the **99.5%** to be aligned with the Solvency II metrics.

Step 4: **Calibrate the three percentages which determine the value of the Risk Correction coherently with the estimated cap and with the data used in the previous steps**

**The calibration of the 3-tier parameters can be obtained** using different techniques, for example **by applying the least square minimization method** to the estimated $RC(t)$ and the risk correction calculated using the EC 3-tier formula.

The proposed parameters (30%, 20%, 10%) provides an example for a calibration which is coherent with the estimated CAP and includes additional prudency with respect to that obtained from the empirical estimation.

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