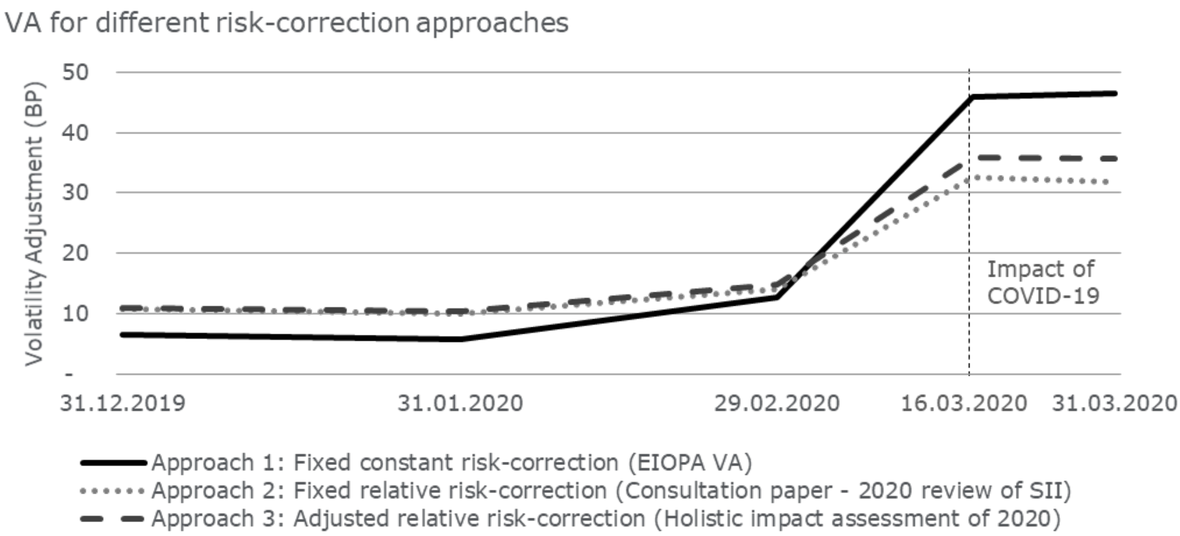
# Reviewing the fundaments of the volatility adjustment




## The risk-correction under the loop

April 2020

## Content

## Introduction

According to the EU Directive 2009/138 and 2019/2177, the volatility adjustment (VA) aims at mitigating the impact of stressed bond spreads on own funds and plays a central role in the Solvency II framework. It is part of the SII 2020 review together with other long-term guarantee measures.

After EIOPA's consultation paper in 2019, a holistic impact assessment is currently taking place until 01 June 2020 to allow EIOPA providing its advice to the European Commission.

Several deficiencies have been identified on the current VA approach. In this paper, we will focus on the misestimation of the risk correction spread and the resulting potential overshooting or undershooting effect.

## Defining the risk-corrected spread

The discussion on the definition of the "risk-corrected spread" is "fundamental" to the determination of the VA, as it addresses its core concept, namely: "correcting for the volatility in bond spreads in a hold-to-maturity portfolio". Aside, one of the perceived VA deficiencies relates to the exact interpretation of the VA. However, regardless of whether the VA represents a "compensation for exaggerations in bond spread" or "an additional illiquidity premium on assets that replicate the liabilities", the risk-corrected spread ought to reflect the component of the spread that is not related to expected credit losses. Hence, appropriately defining the "risk-corrected spread" – equivalently, finding the mathematical relation between the bond spread and its inherent credit component – is central to the VA calculation. Thus, this definition would have to be agreed upon prior to embarking on addressing other deficiencies…

Very roughly, one can write:

$$Bond\ spread\ =\ Expected\ Credit\ Loss\ component\ +\ Liquidity\ Premium,$$

where we have assumed that all non-credit related risks are reflected in the "Liquidity Premium". Following the EIOPA terminology, the "Risk Correction" aims to correct for the non-liquidity-related risks in the bond spread. In this case, one would have:

$$Risk\_Correction = \ Expected\ Credit\ Loss\ component$$

The risk-corrected spread is then defined as:

$$Risk\_Corrected\_Spread\ =\ Bond\ spread\ -\ Risk\_Correction = \ Liquidity\ Premium$$

Finally, the VA is obtained by aggregating various Risk-Corrected spreads across the different investment classes, and multiplying by an application ratio, which aims to capture (i) a correction for the illiquidity of liabilities, and (ii) the duration mismatch between assets and liabilities.

## Key desirable features

Before delving into different calculation approaches for the risk-corrected spread (or equivalently the risk correction), one would want to outline the key desirable features:

i. The risk-correction (expected credit loss component) ought to adequately **reflect the heightened risk of defaults** observed during a crisis ("point-in-time" nature)
ii. The framework should **incentivise proper risk management**
iii. The risk-correction should capture the relevant **basis risks**. In particular, it ought to **take into account the investment horizon**: risk-corrections for longer-term investments ought to be more "through the cycle" (i.e., free of the effect of the credit cycle) in their nature than shorter-term investments. This is particularly important when there is a significant duration gap between assets and liabilities.
iv. The VA ought to maintain its role in **mitigating procyclicality** and **stimulating financial stability** (both in base case scenarios and stressed scenarios).

v. **Simplicity** of calculation is desired.

## Calculation approaches for the risk-correction

In this article, we assess three different approaches for the calculation of the risk-correction, namely:

1. A fixed constant risk-correction
2. A fixed relative risk-correction
3. An adjusted relative risk-correction

The table below discusses the three approaches and their core assumptions.

| # | Approach | Description | Core assumption(s) | Examples & regulatory context |
|---|---|---|---|---|
| **1** | **Fixed constant** risk-correction | The risk-correction is assumed to be a **constant component** of the bond spread. The constant (over time) risk-correction is assumed to be a "through the cycle" measure of credit risk, and is determined by means of a **historical look-back**. | The core assumption of this approach is that changes in bond spreads are (almost) entirely driven by changes in liquidity, and that the credit risk of a bond investment stays constant throughout time. | Examples of this approach include the **original calculation of the risk-correction**, where the risk-correction is expressed as a fraction of a long-term average spread (LTAS) or a 30-year historical average ("through the cycle") default probability and cost of downgrade (PD and CoD).<br><br>For government bonds:<br>$RC = \max(30\% \cdot LTAS_{gov}, 0))$<br><br>For corporates:<br>$RC = \max(35\% \cdot LTAS_{corp}\ , PD + CoD)$ |
| **2** | **Fixed relative** risk-correction | The risk-correction is assumed to be a **fixed fraction** of the bond spread. In other words, the risk-correction scales linearly with the bond-spread. | One assumes that the credit component of a bond spread moves with the macro-economic cycle. Indeed, when a recession hits, default probabilities would increase, and hence one would require a higher credit loss component. As a result, there is a positive relationship between the bond spreads and the risk-correction. This approach assumes a simple linear relationship. | A fixed relative risk-correction is one of the approaches proposed in the **Consultation Paper on the Opinion on the 2020 review of Solvency II**. In this consultation, the "risk correction calculated as a percentage of the spread" (Option 6 in (EIOPA, 2019) pp. 132-146) is defined as:<br><br>For government bonds:<br>$RC = \max(30\% \cdot Spread; 0)$<br><br>For corporates:<br>$RC = \max(50\% \cdot Spread; 0)$<br><br>Where $Spread$ denotes the bond-spread. |
| **3** | **Adjusted relative** risk-correction | Similar to Approach 2, the risk-correction is a fixed fraction of the bond spread. However, in this instance, the fixed fraction (the "slope" of the linear relationship) is **adjusted** when bond spreads exceed a certain threshold. | Similarly to Approach 2, one assumes a positive relationship between the expected credit losses and the bond spread (both driven by the macro-economic cycle). However, one argues here that, in the depth of a crisis, the bond market dries up leading to a spike in the illiquidity spreads (in line with Van Loon & Frank (2017)). As a result, in a liquidity crisis, the credit component would contribute relatively less towards the overall bond spread. | An example such a spread was introduced in **EIOPA's holistic impact assessment of 2020** (EIOPA, 2020). Here the risk-corrections were given by:<br><br>For government bonds:<br>$RC = 30\% \cdot \min(Spread, LTAS_{gov}) + 20\% \cdot \max(Spread - LTAS_{gov}; 0)$<br><br>For corporates<br>$RC = 50\% \cdot \min(Spread, LTAS_{corp}) + 40\% \cdot \max(Spread - LTAS_{corp}; 0)$ |

## Discussion of approaches and mapping against desirable features

The aforementioned approaches all have benefits and disadvantages. In the table below, we compare the desirable features with the considered approaches:

| Desirable features | Applicability to approaches with numbers according to "#" of Table 1 |
|---|---|
| i. Reflecting heightened risk of default during crisis | **Approach 1:** The constant fixed assumes that the default risk remains constant throughout economic downturns.<br><br>**Approach 2:** Contrary to Approach 1, the fixed relative correction approach reflects the fact that a proportion of the increase in bond-spreads during a crisis is due to an increased credit risk.<br><br>**Approach 3:** Similar to Approach 2, Approach 3 assumes that higher bond spreads lead to a heightened credit risk. The underlying rationale of Approach 3, however, is that in a downturn scenario, bond spread increases are also substantially driven by reduced market liquidity (Van Loon & Frank, 2017). Whereas under Approach 2 the relationship between bond spread and (credit) risk-correction is linear, Approach 3 assumes that beyond a certain level (e.g., above the long-term average spread), increases in bond spreads contribute less towards an increase in credit risk. |
| ii. Incentivising proper risk management | **Approach 1:** As a consequence of not reflecting heightened credit risk during the crises, this approach could possibly lead to incorrect incentivises (i.e., investments in higher-risk instruments during economic downturns). That being said, adequate measures in other components of the VA could counteract this incentive.<br><br>**Approach 2 & 3:** Contrary to Approach 1, the relative correction approaches reflect the fact that a proportion of the increase in bond-spreads during a crisis, hence incentivising less-risky investments. |
| iii. Taking into account investment horizon | **Approach 1:** The long-term average or PD and CoD used in Approach 1 could be tailored to reflect the investment horizon. Any "long-term" average spread, however, should span at least one economic cycle (not doing so would mean that the risk-correction only increases after a crisis has occurred, hence yielding a non-desirable pro-cyclical effect). It would be instructive to assess the sensitivity of different calibration windows, and possibly different granularity levels.<br><br>**Approach 2 & 3:** Both approaches can be tailored to appropriately capture the impact of differing investment horizons by adequately calibrating the spread coefficients. Longer-term investment classes would merit lower coefficients compared to longer-term investments. |
| iv. Mitigating procyclicality | **Approach 1:** Given the long-term historical averages, any changes in the bond-spread will be directly reflected in the risk-corrected spread. The resulting VA would hence counteract the effect of any changes in bond spreads.<br><br>**Approach 2:** Only a fraction of the changes in bond-spreads would be counteracted by the VA. Hence, the VA would be overall less countercyclical than Approach 1.<br><br>**Approach 3:** Similar to Approach 2, only a fraction of variations in bond-spreads would counteracted by the VA. However, during a liquidity crisis period, this fraction will increase, leading to an increased countercyclical effect compared to Approach 2, but still less than Approach 1. |
| v. Simplicity | **Approach 1 & 2** are the "simplest" approaches, each having only one calibrated parameter. The estimation of this parameter is relatively straightforward, as it only requires long-term historical spread and default data.<br><br>**Approach 3**: The overall set-up of Approach 3 is still not overly complicated; however, it does require additional assumptions to be made when estimating the various parameters. Indeed, the calibration is likely to lead to challenges when assessing the "phase-shift" for downturn periods, as it necessitates representative crisis-time spread and default data. The calibration of Approach 3 would hence likely rely on strong expert-judgment argumentation. |

## Case study

Figure 1 below illustrates the impact of the three different risk-correction calculation approaches on the VA over the course of the last months (more precisely, we look at the impact on the *currency VA* in EUR, in accordance with Art. 49 Para. 1 of Regulation 2015/35). The solid line corresponds to Approach 1 (fixed constant risk-correction), and is in line with the VA published by EIOPA in their monthly technical specifications of the risk-free interest rate term structures. Approaches 2 and 3 are represented respectively by the dotted and dashed lines. It is important to point out that in the calculation of this impact assessment, the only difference between the VAs lies in the calculation of the risk-correction. The aggregation approach and application ratios are the same across the three approaches, allowing for a *like-for-like comparison*. (More precisely, for the dates prior to March 2020, the 2019 EIOPA representative portfolio and corresponding government and corporate bond weights are applied, whereas for the March 2020 dates, the 2020 EIOPA representative portfolio is applied. Note, however, that any changes in government and corporate bond weightings would not materially affect the conclusions.)

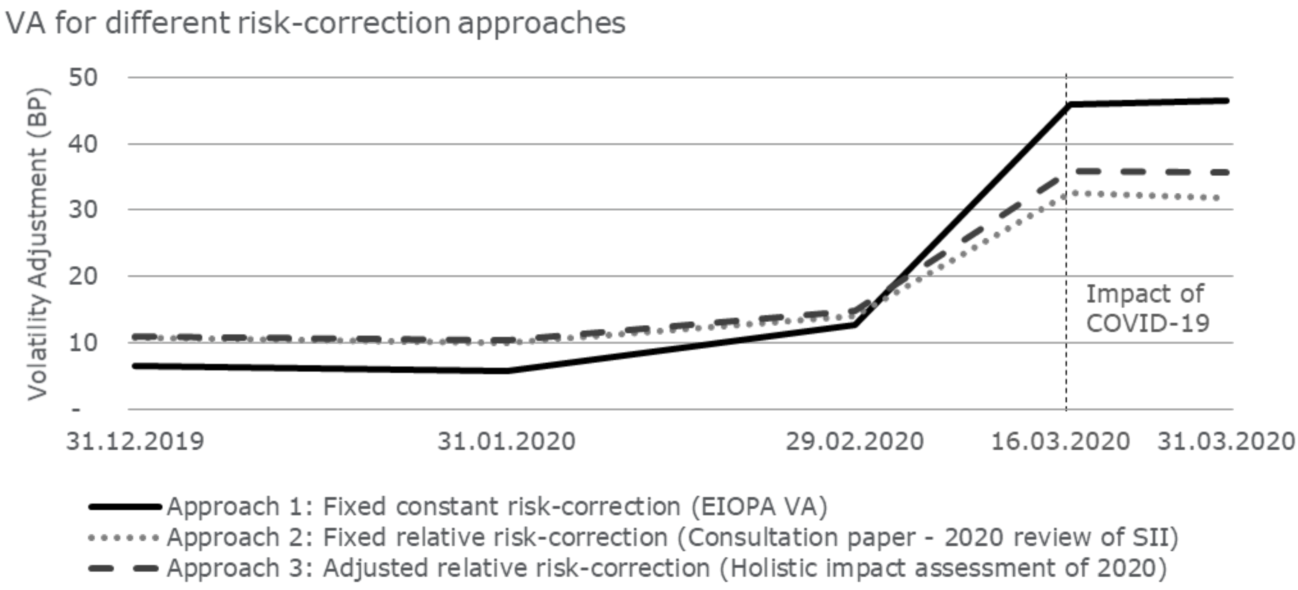



*Figure 1 Impact of risk-correction calculation approaches on the volatility adjustment*

The above figure confirms our prior statements on how Approach 1 provides the highest reactivity to changes in the macro-economic environment, and hence has the most countercyclical impact. Furthermore, we can also see that, in benign economic conditions (prior to March 2020), Approaches 2 and 3 yield similar VAs. However, in a downturn economic environment (COVID-19), Approach 3 allows for an increased countercyclical effect.

## Discussion and further developments

In this article, we assessed one of the fundamental building blocks of the volatility adjustment: the risk-correction. We highlighted a number of desirable features, and mapped these against three candidate calculation approaches:

1. The fixed constant risk-correction, as currently used in calculating the VA under Solvency II.
2. A fixed relative risk correction, as proposed in the Consultation Paper on the Opinion on the 2020 review of Solvency II.
3. An adjusted relative risk correction, as assed under EIOPA's holistic impact assessment of 2020.

The two relative risk correction approaches (Approach 2 and 3) are preferred from a theoretical and risk-management perspective, as they reflect a heightened credit risk during economic downturns. These approaches are hence also more consistent with other accounting standards such as IFRS9 and its US-equivalent CECL, where expected credit losses are accounted for by a "point-in-time" risk metric.

Capturing the heightened credit risk during economic downturns, however, comes at the cost of a reduced countercyclicality. In contrast to Approach 2 and 3, the long-term averages used to calculate the fixed constant risk-correction under Approach 1, imply that any changes in the bond-spread are directly reflected in the risk-corrected spread, which subsequently results in a more countercyclical VA. Approach 3 manages to retain an increased level of countercyclicality to a certain extent, by reducing the relative credit risk proportion of the bond spreads once they go beyond a certain level (e.g., the long-term average spread).

Despite some of the theoretical benefits of Approach 3, it does require the estimation of a number of additional parameters, which could lead to challenges given the scarcity of representative crisis-time liquidity spread data. In practice, the calibration likely relies on a number of strong expert-judgment arguments. In a next phase, the analyses presented in this article could be further enhanced by diving into potential calibrations for the different risk-correction approaches, including:

- Assessments of different time horizons for the LTAS used in approaches 1 and 3.
- Analyses of available liquidity spread data to gauge the size of the downturn coefficients under Approach 3, as well as assessing suitable levels of granularity (e.g. by elaborating on the proposed calibration approaches laid out in EIOPA (2019), pp. 134-146).

Other measures such as the introduction of a "macro-economic VA" (see EIOPA (2019), pp. 150-156) can further tune the counter-cyclical effect of the VA. One might want to further assess the suitability of the three risk-correction approaches in this context. Going forward, the reassessment of the volatility adjustment framework could be complemented in the risk management system with either (i) an undertaking specific VA (EIOPA (2019), pp. 109-111) or (ii) a "monetary" VA calculation based on a liquidity-adjusted value of an undertaking's own asset portfolio, as discussed in Meli, de Leval & Garston (2018). Such a self-assessment of the VA ought to be accompanied with appropriate safeguards including: ORSA analyses, credit risk management policy reviews and, regular monitoring and reporting on the current asset allocations (see EIOPA (2019), pp. 102-103).

As a final statement, we would like to re-iterate the importance of liquidity risk management within financial institutions. Whereas the VA aims to incorporate the effect of the long-term investment horizons, it also leads to the fact that asset-side liquidity risk is not reflected under Pillar I in Solvency II. Asset-side liquidity is a crucial component in ensuring solvability, and ought to be a key topic in the risk management of any insurance company, especially in economic downturns.

## Glossary

| **Abbreviation/Acronym** | **Explanation** |
|---|---|
| € | Currency Euro |
| BP | Basis Points (equivalent to 0.01%) |
| CECL | Current Expected Credit Losses |
| CoD | Cost of downgrade |
| Corp | Corporation |
| COVID-19 | Corona Virus Disease 2019 |
| EIOPA | European Insurance and Occupational Pensions Authority |
| LTAS | Long Term Average Spread |
| ORSA | Own Risk and Solvency Assessment |
| PD | Probability of Default |
| RC | Risk-correction |
| SII | Solvency II |
| TTC | Through the Cycle |
| VA | Volatility Adjustment |

# References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