

MILLIMAN REPORT

Solvency II under review: Part 2

Revisiting the Volatility Adjustment—a sometimes overlooked risk mitigant

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1. Introduction

This paper is part of our series of research papers providing updates on Pillar 1 requirements since the implementation of Solvency II in January 2016. The series charts some of the most material changes that have been made since then as well as looking forward to potential changes that have already been highlighted by the European Commission (EC) and the European Insurance and Occupational Pensions Authority (EIOPA). These changes could have significant impacts on individual companies and therefore firms may need to reassess their capital management strategies. In Part 1 we revisited the rules in specifying the risk-free rate term structure, looking in detail at changes to the Ultimate Forward Rate (UFR). In this paper we examine the Volatility Adjustment (VA).

The VA is one of the Long-Term Guarantee (LTG) measures under Solvency II which aims to ensure the appropriate treatment of insurance products with long-term guarantees. However, the VA also affords applicability to other types of products with long-term liability cash flows and one of the aims of this paper is to reexamine the potential for companies to use the VA for their businesses. In this paper we also examine the features of ongoing risk management with regards to the application of the VA.

The UK's Prudential Regulation Authority (PRA) has described the VA succinctly as follows:¹

The purpose of the VA is not to help smooth volatility in the Solvency II balance sheet arising from movements in the risk-free rate. The purpose of the VA is to prevent the requirement for market-consistent valuation of assets and liabilities under Solvency II from dis-incentivising insurers from investing in assets that it would otherwise be appropriate for the insurer to hold, taking into account the nature and duration of their insurance liabilities. The VA aims to mitigate 'artificial' balance sheet volatility caused by short-term market volatility in the value of assets by allowing insurers to reflect movements to those asset prices within the market-consistent valuation of the corresponding liabilities. This helps eliminate the need for the insurer to engage in pro-cyclical investment behaviour in order to address this 'artificial' balance sheet volatility.

More technically, under the VA insurers are allowed to adjust the risk-free interest rates used in valuing their Best Estimate Liabilities (BELs) to mitigate the effect of short-term volatility of bond spreads on their solvency positions. For the purposes of this paper we refer to the adjustment to the risk-free interest rates as the 'VA rate'. The VA is intended to prevent pro-cyclical investment behaviour of insurers. The VA rates, which vary by currency and country and are determined by EIOPA, are derived from the yield spreads of reference portfolios of assets made up of bonds, loans and securitisations for different currencies and countries.

2. Executive summary

The application of the VA likely improves the Solvency II balance sheet in terms of Own Funds and reduces the Solvency Capital Requirement (SCR). To the extent that a company's assets are invested in a similar way to the reference portfolio, the fall in asset values that would arise from a widening of spreads in the portfolio would therefore be partially offset by an increase in the VA and a corresponding reduction in liabilities.

Unlike the Matching Adjustment (MA), use of the VA does not impose very strict restrictions on a firm's asset holdings and, in particular, firms do not have to hold the reference portfolio in order to recognise the VA for liability calculation purposes.

VA rates have varied over time, and by currency and country. The table in Figure 1 summarises the observed VA rates since 2014 for key currencies and countries in basis points (bps).

¹ PRA (November 2017). Solvency II: Supervisory Approval for the Volatility Adjustment. Consultation Paper CP22/17. Retrieved 23 January 2019 from <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/consultation-paper/2017/cp2217>.

FIGURE 1: VA RATE IN BPS

COUNTRY	END 2014	END 2015	END 2016	END 2017	H1 2018	END 2018
Euro*	18	22	13	4	10	24
UK Sterling	23	31	30	18	21	27
US Dollar	51	78	50	28	38	56
Japanese Yen	1	3	2	2	1	3
Swiss Franc	5	9	5	-3	0	4
Swedish Krone	3	6	3	2	4	12

* Without any country adjustment.

The VA rates have generally trended downwards since they were first calculated at the end of 2014 for the preparatory phase of Solvency II, owing to narrowing credit spreads in the underlying markets. Notwithstanding the general low level of market spreads in recent periods, it is important to note that the VA is a mitigating measure that would likely soften the impact of future spread increases.

EIOPA has backtested the methodology to derive the VA by applying it to market data from 2005 to 2014. During the years 2005 and 2006 the VA would have been close or equal to zero, but without turning negative. In 2008 and 2009 the VA would have reflected the unfolding of the banking crisis by increasing to a maximum value of around 350 bps. In 2010 the VA would have returned to a level slightly above 50 bps. In 2011 the VA would have increased again up to a local maximum of around 150 bps at the end of that year, at the peak of the sovereign debt crisis.

By construction the VA only considers 65% of the risk-corrected spreads of a reference portfolio. As a result, a fall in asset values due to an increase in assets' risk-corrected spreads will only be partially offset by the reduction in the present value of liabilities due to the corresponding increase in the VA. Consequently, in the absence of other effects, an increase in risk-corrected spreads will lead to a decrease in Own Funds and vice versa.

The VA is not recalculated as part of the spread risk SCR for standard formula companies i.e. the amount of the VA should be assumed to be the same before and after the application of the spread risk SCR shock. The reasoning behind this could be that the spread risk module (where the SCR from credit risk is calculated) aims to capture the risk related to the assets that the company has invested in rather than the risk of a general increase in spreads. The VA on the other hand is aimed at capturing the general spreads in the market, i.e. it is not company specific. If the general spreads available increase it will be reflected in the VA and hence increase the available capital. Since the amount of the VA is kept constant in the SCR calculation it will actually affect the size of the SCR. In the interest rate risk module the size of the VA will in relative terms be smaller in the upwards scenario and larger in the downwards scenario as a percentage of the stressed interest rates and hence dampen the effect of the stresses in the liability valuation.

However, for internal model companies the use of a dynamic volatility adjustment (DVA) permits firms to allow the size of the VA to change when modelling credit spreads in their SCR calculations.

According to EIOPA statistics at the end of 2017,² removal of the VA reduces the overall solvency ratio (defined as Own funds / SCR) of European Union (EU) insurance undertakings from 239% to 230%. Excluding undertakings that do not use the VA at all, the equivalent average solvency ratio falls from 239% to 222%.

The VA is the most widely used item of the Solvency II LTG measures. However, the relative lack of application of the VA in some markets would suggest there are many companies that could still benefit from its use.

Requirements on using the VA within the Solvency II Directive mainly fall into the risk management and disclosure domains. It is noteworthy that Recital 39 of the Omnibus II Directive says that national supervisory authorities (NSAs) should be able to reject the use of the VA only in 'exceptional circumstances'.

In practical terms, key considerations that should be made in determining the applicability of the VA to certain lines of business include:

- Investment strategies employed are not impacted by the use of the VA.

² EIOPA (18 December 2018). Report on Long-Term Guarantee Measures and Measures on Equity Risk, 2018. Retrieved 23 January 2019 from https://eiopa.europa.eu/Publications/Reports/2018-12-18%20_LTG%20AnnualReport2018.pdf.

- Sufficient liquid resources are held to avoid engaging in pro-cyclical investment behaviour.
- The yield on assets is sufficient to support the yield implied by the discount curve including the VA.

EIOPA has highlighted the considerable heterogeneity of spreads being earned by firms among the countries of the eurozone. This highlights the continuing need for firms to carefully manage their uses of the VA in the context of their own asset and liability portfolios.

From a risk perspective firms may also wish to consider how an 'individualised VA' would affect their business. By this we mean a VA rate determined based on the spreads being earned on a company's own set of assets rather than on an average industry reference portfolio. Such an approach would help to alleviate the basis risk and duration-gap problems which are discussed in this paper. Aside from such risks, the ongoing governance requirements are limited, and while a company will have an increase in workload and cost arising from the requirement to calculate the Solvency II results with and without the VA, this is unlikely to generate significant operational risk.

In its 2017 LTG Report³, EIOPA highlighted some lack of transparency around public disclosure on the use of the VA by companies. Some stakeholders have expressed interest in additional public disclosure.

The 2018 LTG report considered a thematic focus on risk management aspects firms undertake with regards to the VA with EIOPA commenting about a number of identified deficiencies.

Overall, we expect to see continued interest in the VA. Indeed, on 8 February 2019 the EC issued a request⁴ to EIOPA to consider interim measures that could be adopted to address concerns related to the country-specific adjustment in advance of the full Solvency II review due for 2020.

3. Recap on the nature of the VA

The VA is expected to be a reasonably predictable adjustment to risk-free rates, calculated at a currency level. An additional country-specific adjustment may apply to the VA if certain market conditions exist, based on the country in which liabilities are written. The application of the VA is set out in Article 77d of the Solvency II Directive. Appendix 1 provides a summary of the calculations under illustrative market conditions.

The VA is based on 65% of the risk-corrected spread between the yield that could be earned from bonds, loans and securitisations included in a reference portfolio, and the basic risk-free interest rates.

In the remainder of this paper the VA rate determined at a currency level will be referred to as the Currency VA. Where an additional -specific adjustment applies it will be referred to as the Country VA. Where it is not necessary to make such a distinction the terms 'VA' and 'VA rate' are used more generally.

The VA is not a permanent positive addition to the risk-free rates. The adjustment could turn negative when observed spreads are lower than the historical spreads calculated according to the specified Solvency II methodology. However, this is limited to the level of the risk-correction. In practice it would be expected that bonds would maintain a positive spread, as in general investors could hold swaps as an alternative (with reduced credit risk).

The application of the VA likely improves the Solvency II balance sheet in terms of Own Funds and reduces the overall SCR. In the interest rate risk module the size of the VA will in relative terms be smaller in the upwards scenario and larger in the downwards scenario as a percentage of the stressed interest rates and hence dampen the effect of the stresses in the liability valuation due to general interest rate movements captured in the SCR. However, for standard formula firms, within the spread risk module the VA should be assumed to be the same before and after the application of an SCR shock for standard formula firms.

Applying the VA will likely give a partial reduction in a company's actual spread risk exposure in terms of its Technical Provisions (TPs) and Own Funds. An increase in spreads in the reference portfolio would result in an increase in the VA. To the extent that a company's assets are invested in a similar way to the reference portfolio, a fall in asset values that would arise from a widening of spreads in the portfolio would therefore be partially offset by an increase in the VA and a corresponding reduction in liabilities.

³ EIOPA (20 December 2017). Report on Long-Term Guarantee Measures and Measures on Equity Risk, 2017. Retrieved 23 January 2019 from <https://eiopa.europa.eu/Publications/Reports/2017-12-20%20LTG%20Report%202017.pdf>

⁴ https://eiopa.europa.eu/Publications/Requests%20for%20advice/signed_letter_08_02_19.pdf

Appendix 2 covers the Pillar 1 impact of the VA in more detail whilst Appendix 3 provides an illustration of sample liability valuations across varying durations under the VA.

It is not immediately clear from the regulatory requirements set out in the EU-wide Solvency II rules whether there is an expectation that firms applying the VA should be yielding spreads on their own assets at least commensurate with that VA rate. However, the UK's PRA has made it clear⁵ that in its view firms should demonstrate that they have considered the compatibility of their investment strategies with the Prudent Person Principle, given that the VA is used.

In particular, the PRA has stated its expectation that, where a firm is reliant on the yield from assets with an uncertain return or on the returns achieved on reinvestment to support the use of the VA, the firm should consider the risk that the assumed return is not achievable in practice and demonstrate how this risk will be monitored and managed. In effect, firms should review achieved yields on assets backing VA business, and consider the level of reliance on assets with uncertain yields and how it may impact the ability to earn yields at least at the level of the relevant VA rate.

EIOPA publishes the VA for each relevant national insurance market on a monthly basis. More details on EIOPA's methodology are set out in Appendix 4. Processes and controls are required to ensure that the VA is correctly applied in the calculation of the BEL by firms and to ensure it is not applied to any liabilities where a MA is applied.

Typically EIOPA publishes the risk-free rate term structure, including the VA, on workday five of each calendar month. Owing to reporting deadlines many firms will seek to estimate the VA rate in advance of EIOPA's publication. Although an involved calculation, accurate estimates are generally possible given the level of EIOPA's disclosure of their calibration methodology. The process for producing such a VA estimate should be automated as much as possible to minimise the possibility of human error.

4. Case Study – ALM illustration

In order to illustrate the possible movement in the value of a long-term liability cashflow in comparison to a matching asset in response to a spread and consequent VA increase, we considered a liability of €100 payable after 30 years. The initial discounted value of this liability using the end September 2018 EIOPA curve (including the VA of 13bps) is €54.67. We then assume a zero coupon bond is initially held with a value of €54.67. For varying bond durations the table below (Figure 2) shows the approximate change in value of the assets and liabilities assuming a 20bps increase in market spreads and a 13bps increase in the VA due to the 65% factor applied. (In practice, there would likely be a term structure dimension to any spread movements.)

FIGURE 2: NAV MOVEMENT FOR A 30 YEAR LIABILITY DUE TO A 20BPS INCREASE IN MARKET SPREADS

ZERO COUPON BOND DURATION	ASSET MOVEMENT	LIABILITY MOVEMENT	NAV MOVEMENT
5 years	-0.54	-1.71	+1.17
10 years	-1.08	-1.71	+0.63
15 years	-1.61	-1.71	+0.10
20 years	-2.14	-1.71	-0.43
25 years	-2.66	-1.71	-0.95
30 years	-3.18	-1.71	-1.47
35 years	-3.69	-1.71	-1.98
40 years	-4.20	-1.71	-2.49
45 years	-4.70	-1.71	-2.99
50 years	-5.20	-1.71	-3.48

This analysis demonstrates that under a cashflow matching position (holding a bond with 30 year duration) the NAV will still fall significantly as a result of a flat increase in spreads. This is partly due to the fact that the yield curve for the purposes of discounting the liability cashflow does not move in a parallel fashion beyond the LLP as well as the 65% factor applied. Nonetheless the presence of the VA dampens the NAV movement by more than 50% in relative terms

⁵ PRA (November 2017), CP22/17, ibid.

i.e. due to the VA the liability reduces by €1.71 to partly offset the asset fall of €3.18. By holding bonds of somewhat lower duration the NAV is more stable i.e. around 15 years in this example.

Figures 3 and 4 show the equivalent impacts where the VA increases by 50bps and 100bps (and consequent increases in the VA of 32.5bps and 65bps).

FIGURE 3: NAV MOVEMENT FOR A 30 YEAR LIABILITY DUE TO A 50BPS INCREASE IN MARKET SPREADS

ZERO COUPON BOND DURATION	ASSET MOVEMENT	LIABILITY MOVEMENT	NAV MOVEMENT
5 years	-1.35	-4.18	+2.84
10 years	-2.66	-4.18	+1.52
15 years	-3.94	-4.18	+0.24
20 years	-5.19	-4.18	-1.01
25 years	-6.41	-4.18	-2.23
30 years	-7.60	-4.18	-3.41
35 years	-8.76	-4.18	-4.57
40 years	-9.89	-4.18	-5.70
45 years	-10.99	-4.18	-6.81
50 years	-12.07	-4.18	-7.88

FIGURE 4: NAV MOVEMENT FOR A 30 YEAR LIABILITY DUE TO A 100BPS INCREASE IN MARKET SPREADS

ZERO COUPON BOND DURATION	ASSET MOVEMENT	LIABILITY MOVEMENT	NAV MOVEMENT
5 years	-2.65	-8.05	+5.39
10 years	-5.18	-8.05	+2.87
15 years	-7.58	-8.05	+0.47
20 years	-9.87	-8.05	-1.82
25 years	-12.04	-8.05	-3.99
30 years	-14.11	-8.05	-6.06
35 years	-16.08	-8.05	-8.03
40 years	-17.95	-8.05	-9.90
45 years	-19.73	-8.05	-11.69
50 years	-21.43	-8.05	-13.38

In practice, the spread movements affecting a specific set of assets may move somewhat differently to the average market spread movements underlying the VA calculations.

In our calculations we have also effectively assumed that the risk correction part of the VA does not change.

We do not show the impact on the SCR or Risk Margin.

5. Regulatory rules and approach to VA

National regulators are free to decide whether or not firms must apply for approval to use the VA. Germany, Ireland and the UK are amongst the 10 countries which impose such an approval process whilst France, Italy and the Netherlands do not. It is noteworthy that Recital 39 of the Omnibus II Directive says that NSAs should be able to reject the use of the VA only in 'exceptional circumstances'.

The requirements to use the VA are not as involved as those for gaining approval to use the MA. The application process (where required) is generally not about putting additional barriers in place but verifying compliance with the regulatory requirements, in particular covering:

- The material required by the Solvency II Directive from all firms using the VA, i.e., a written policy on the criteria for application of the VA, a liquidity plan and a risk management plan.

- The correct application of the VA to the risk-free interest rate term structure.
- Confirmation that the use of the VA will not result in pro-cyclical investment behaviour, i.e., encouraging excessive risk-taking during upturns that could be crystallised during downturns in the economic cycle.

The UK's PRA also requires that a firm's governing body should seek advice from a relevant Senior Insurance Manager (likely to be principally the Chief Risk Officer, Chief Actuary and possibly a Senior Investment Manager and the Compliance Officer) and the Actuarial Function (within their existing responsibilities) to strengthen the governance surrounding an application to use the VA.

In its 2018 LTG Report EIOPA commented on criteria it would consider relevant in determining whether an undue capital relief was being gained for undertakings applying the VA. These criteria include:

- The extent an undertaking applying the VA is exposed to a fluctuation of credit spreads.
- Undertakings potential to earn the VA.
- Whether undertakings are actually earning the VA in practice.
- Whether liabilities are sufficiently illiquid so that the risk of forced sales of assets is low.

6. Historical development of the VA rates

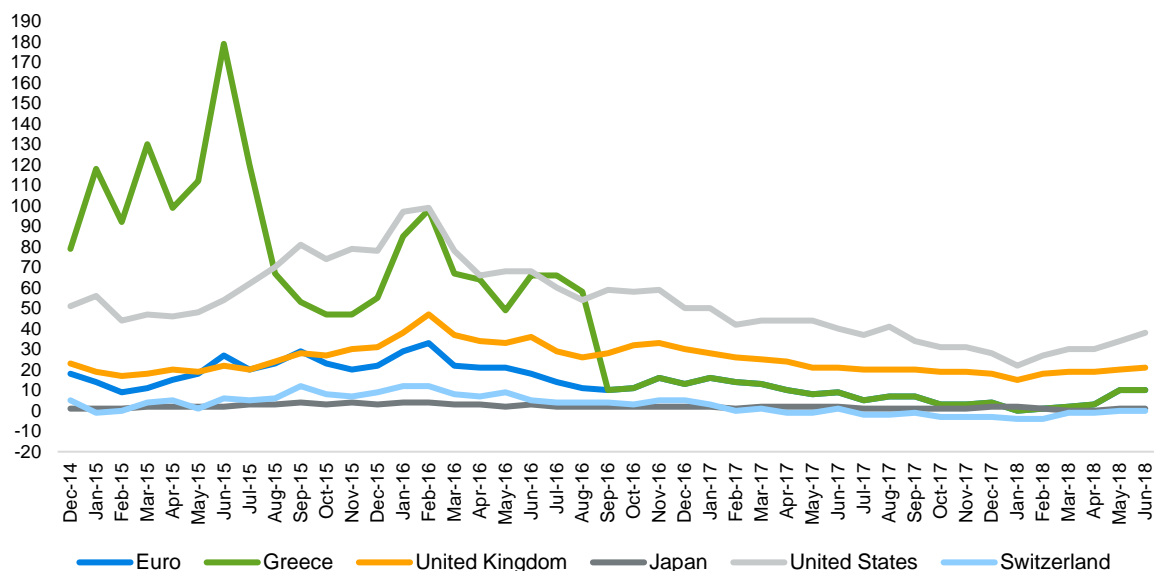
The core elements that drive the behaviour of the VA rate over time include:

- Credit spreads on government bonds and corporate bonds
- The weightings of the relevant VA reference portfolio in those bonds
- Risk corrections
- The impact of the 100 bps threshold regarding the country spread

The key driver for changes in the VA from month to month is identified as the credit spreads because the weighting factors and risk correction would be expected to be relatively stable, certainly over short periods.

The graph in Figure 5 charts the development over time of the VA in basis points (bps) for a selection of currencies and countries.

FIGURE 5: VA RATES (BPS) SINCE DECEMBER 2014



Source: EIOPA

Salient features that can be observed from Figure 5 include:

- The VA rates have generally trended downwards over time owing to narrowing credit spreads in the underlying markets
- Negative VA rates have been observed at times in some countries, e.g., Switzerland
- There has been a relatively large range of VA rates across currencies and countries

- The relatively high Currency VA for the US dollar partly reflects the fact that the reference portfolio is made up of a relatively high proportion of non-sovereign assets attracting a yield spread (56% at June 2018 compared to 41% for the euro and 31% for sterling).

The method of applying the country-specific adjustment has been met with some controversy. As stated earlier, the mechanism takes effect only if certain thresholds are passed. For example, at the end of June 2018, for some countries in the eurozone the condition for the country spread to be higher than twice the currency spread was met (e.g., for Greece, Italy, Portugal and Spain), but the second condition for the risk-corrected country spread to be higher than 100 bps was not met. In fact, since the end of 2014, the only eurozone countries to experience a country-specific volatility increase have been Greece and Italy. The VA for Greece, for example, reached levels as high as 179 bps in June 2015. However, by September 2016 the VA for Greece had merged with the Currency VA for the euro with no country-specific adjustment.

For some countries in the eurozone, the country spread has been much higher recently than the currency one (e.g., Greece, Italy, Portugal and Spain), whilst for other countries it was much lower (e.g., Belgium, Estonia, Finland, Ireland, Lithuania, Malta, Slovakia and Slovenia). This means that, at country level, the spread deriving from assets held by the national undertakings can be significantly higher or lower than the level of spread underlying the relevant representative portfolio.

This issue has been recently highlighted in the Italian market. Italian insurers have above-average weightings in domestic securities. The spread between Italian government bonds and German government bonds increased materially at the end of May 2018. However, Italian insurers initially did not see much change in the VA rate whilst being hit with significant reductions in value of their Italian government bond holdings. However, between the end of July 2018 and the end of August 2018 the VA jumped from 8 bps to 60 bps for Italian liabilities. This pattern has led to some volatility in balance sheets.

Other relevant points of note from the history of VA country spreads include:

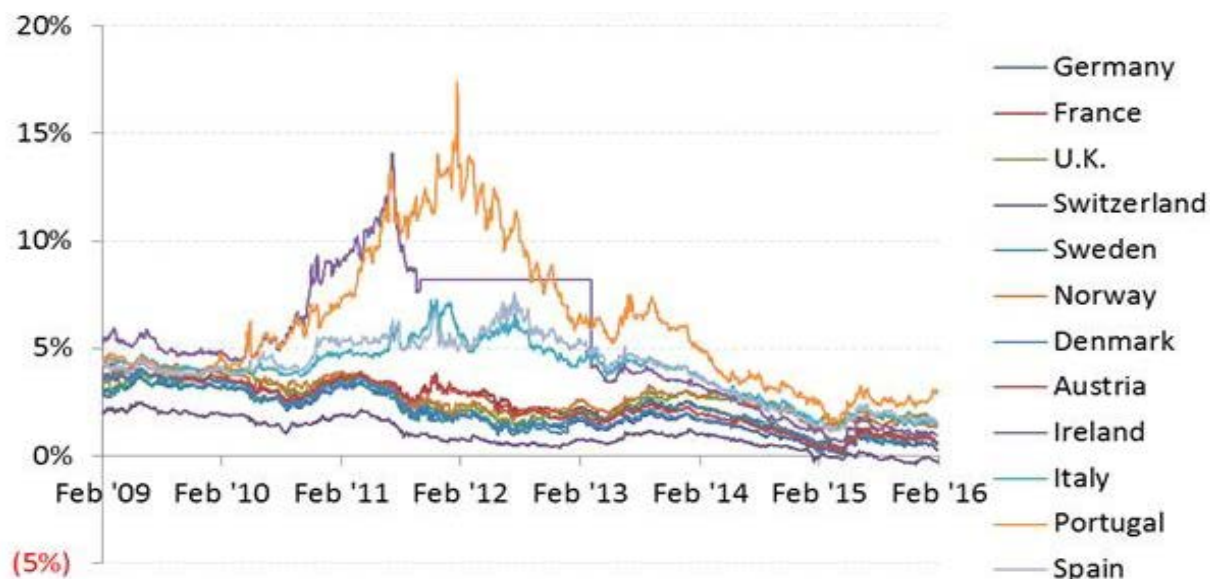
- For most countries (except Cyprus and Greece), corporate spreads are largely higher than government ones.
- The Japanese yen VA has been very close to zero throughout the period.
- The UK and US VAs have been quite high relative to the euro owing to generally higher underlying spreads as well as a higher proportion of corporate bonds in the reference portfolio.
- The Country VAs for Switzerland and Romania have been negative at times.

7. Future VA rates

Given the generally lower proportion of government bonds compared to corporate bonds in the EIOPA reference portfolios, the VA is typically more sensitive to changes in corporate bond spreads than government bond spreads. Additionally, under an equivalent percentile stress, it would be expected that the government bond spread stress would be lower than the corporate bond spread stress, further increasing the significance of the effect of corporate bond spread changes on the level of the VA when compared to government bond spread changes.

Notwithstanding the general low level of market spreads in recent periods, it is important to reiterate that the VA is a mitigating measure that would likely soften the impact of future spread increases. Looking back at the peak of the 'sovereign bond crisis' in 2010 to 2012 (see Figure 6 below), much higher market spreads were observed at that time for a number of eurozone countries that would have given rise to a much higher VA rate.

FIGURE 6: 10-YEAR BOND YIELDS DURING EUROPEAN SOVEREIGN BOND CRISIS



Source: Bloomberg, Hamilton Capital

Markets have also experienced periods of significantly higher corporate bond spreads relative to the more benign conditions in recent years.

Reflective of such periods of widened spreads, under the 'double hit scenario' tested in EIOPA's 2016 Insurance Stress Test,⁶ a significant increase in the VA was considered. The stress test was carried out under 15 June 2016 market conditions where the base case Currency VA for the euro was 20 bps. Under the stress scenario the VA was projected to increase to 141 bps for the euro.

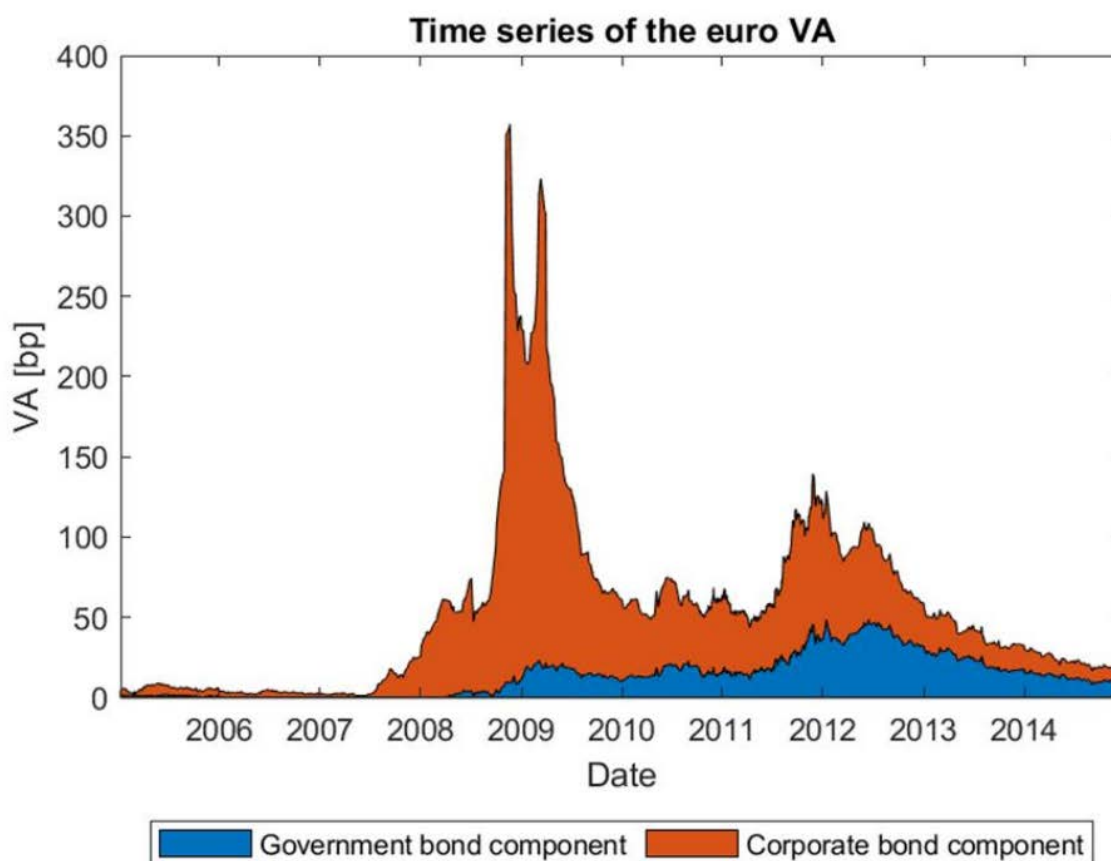
Similarly, in the specifications for the 2018 Insurance Stress Test,⁷ EIOPA considered a scenario whereby the Currency VA for the euro moves from 4 bps as at 31 December 2017 to 49 bps post-stress.

EIOPA has also backtested the methodology to derive the VA by applying it to market data from 2005 to 2014. The calculations were done on the basis of the representative portfolio applicable at the end of Q3 2018 because appropriate historical data on the asset allocation from 2006 to 2014 is not available. The following graph (Figure 7) shows the development of the VA for the euro for the market conditions from 2005 to 2014 and its decomposition into a component for government bond spreads and for corporate bonds spreads. The calculation does not take into account any country-specific increase.

⁶ EIOPA (1 June 2016). Insurance Stress Test 2016: Technical Specifications. Retrieved 23 January 2019 from [https://eiopa.europa.eu/Publications/Surveys/EIOPA-BoS-16-109%20ST2016%20Technical%20Specifications%20\(20160601\).pdf](https://eiopa.europa.eu/Publications/Surveys/EIOPA-BoS-16-109%20ST2016%20Technical%20Specifications%20(20160601).pdf).

⁷ EIOPA (14 May 2018). Insurance Stress Test 2018: Technical Specifications. Retrieved 23 January 2019 from https://eiopa.europa.eu/Publications/Surveys/EIOPA-BOS-18-189_Technical%20Specifications_v20180622.pdf.

FIGURE 7: EURO VA RATE BACKTESTED BY EIOPA



Source: EIOPA

During the years 2005 and 2006 the VA is close or equal to zero, but without turning negative. In 2008 and 2009 the VA reflects the unfolding of the banking crisis by increasing to a maximum value of around 350 bps. In 2010 the VA returns to a level slightly above 50 bps. In 2011 the VA increases again up to a local maximum of around 150 bps at the end of that year, at the peak of the sovereign debt crisis.

EIOPA has also calculated the VAs for all other relevant currencies and the applicable national increases. The calculations show that for some currencies and countries, in particular with an exposure to corporate bonds of CQS4 and 5 and long durations, the VA reaches a level of 1000 bps and higher during the banking crisis.

These results point to the fact that the VA rate could vary considerably over time, highlighting the potential for firms to benefit from its use but also the need for firms already using the VA to appropriately manage their exposures to credit spreads.

It is worth noting that the following factors also contribute to the overall impact of applying the VA on liability valuation:

- Changes to the last liquid point (LLP), as the VA is only applied directly to risk-free rates before the LLP.
- Changes to the UFR, as the VA indirectly affects liability valuation beyond the LLP through the extrapolation of the risk-free rate curve.

As part of the 2018 LTG Report EIOPA commented on the use of the VA in pricing products. For undertakings that use the VA in their pricing the most common way is to allow for the VA in the discount rate used to price new products. Other undertakings allow for the VA when performing profit testing scenarios on new products. Some undertakings indicated that the VA has an impact on the cost of holding capital, which they take into account in product pricing.

8. VA and risk management

Perhaps the most important risk benefit of applying the VA is the partial reduction it can bring in a company's actual spread risk exposure in terms of its TPs and Own Funds. An increase in spreads in the reference portfolio would result in an increase in the VA. To the extent that a company's assets are invested in a similar way to the reference portfolio, the fall in asset values that would arise from a widening of spreads in the portfolio would therefore be partially offset by an increase in the VA and a corresponding reduction in liabilities. Clearly this introduces an element of basis risk, given that the company's assets are not likely to match the reference portfolio exactly, but compared with not using the VA, the application of the VA would be likely to reduce a company's exposure to widening credit spreads.

Actual movements in the VA relative to the movements in yields on a company's assets will be a complex mix of the asset type exposures, currency exposures, country exposures and duration exposures of each respective portfolio. However, it would generally be expected that there would be a reasonable correlation across different fixed interest assets, certainly for relatively diversified portfolios. On the other hand, the VA does not mitigate against a lack of diversification in general, so companies need to take care regarding holding a concentrated portfolio of fixed interest assets.

The precise effect of application of the VA on the Own Funds of a company and their movements over time particularly depends on the 'duration gap' of how the duration of assets subject to spread movements compares to the duration of liabilities. As the VA is a one-size-fits-all measure it does not take into account the particular duration of a company's set of assets. In fact, the VA is kept constant until the LLP, after which it converges slowly to zero as a result of the Solvency II extrapolation technique. In practice this means that the VA is applied to the full duration of the liabilities of a company regardless of whether the credit spread can be earned on the assets for such a long period.

In principle, the VA is designed to closely immunise a company's Own Funds against movements in spreads, in other words with the expectation that liability movements with application of the VA will be more in line with asset movements. The VA is calibrated by EIOPA with regards to an average duration of liabilities across industry sectors without taking into account average asset durations let alone individual companies' asset durations. Therefore, if the duration of those assets exposed to spreads is less than the duration of liabilities it could result in the strange situation that an increase in spreads actually improves Own Funds if the movement in liabilities is greater than the movement in assets.

As noted earlier, EIOPA has highlighted the considerable heterogeneity of the risk-corrected country spread among the countries of the European Economic Area (EEA). Such heterogeneity is further emphasised by the average asset portfolios of undertakings applying the VA in various countries at the end of 2017, shown in the table in Figure 8 below.

FIGURE 8: INVESTMENT ALLOCATION AT EEA AND COUNTRY LEVEL OF UNDERTAKINGS APPLYING THE VA (EXCLUDING ASSETS HELD FOR UNIT-LINKED CONTRACTS)

COUNTRY	GOVERNMENT BONDS	CORPORATE BONDS	EQUITIES	COLLECTIVE INVESTMENT VEHICLES	MORTGAGES & LOANS	CASH & DEPOSITS	OTHER
EEA	33	31	12	9	5	4	5
Austria	27	33	18	8	4	3	6
Belgium	50	23	7	1	11	3	5
Bulgaria	68	6	10	0	0	13	3
Cyprus	(*)	(*)	(*)	(*)	(*)	(*)	(*)
Czech Republic	44	38	7	5	1	4	1
Germany	20	30	16	22	6	2	4
Denmark	16	29	22	23	3	2	4
Spain	60	22	5	1	1	8	4
Finland	13	41	9	16	4	9	7
France	33	40	11	4	2	3	6
Greece	64	22	5	1	1	5	2
Hungary	84	1	2	5	0	7	0
Ireland	32	27	1	1	1	38	1
Italy	52	22	14	2	1	3	6
Lithuania	22	44	9	1	7	17	0
Luxembourg	37	40	7	2	2	8	3
Netherlands	37	14	4	6	29	5	6
Norway	14	42	22	10	10	2	0
Portugal	53	31	2	9	0	3	2
Romania	(*)	(*)	(*)	(*)	(*)	(*)	(*)
Sweden	(*)	(*)	(*)	(*)	(*)	(*)	(*)
Slovakia	56	30	5	0	2	6	1
UK	20	27	9	16	9	16	3

Source: EIOPA. Due to confidentiality reasons, any cells that relate to less than three undertakings are denoted by (*).

Further heterogeneity can be observed across the credit quality and duration of bonds.

These observations highlight the need for firms to carefully manage their use of the VA in the context of their own asset and liability portfolios.

From a risk perspective, firms may also wish to consider how an 'individualised VA' would affect their business and help to alleviate the basis risk and duration-gap problems. This would involve calculating relevant spreads on a company's own portfolio of assets to derive an alternative form of volatility adjustment more adapted to its specific asset holdings. Such a methodology would better reflect the non-default-related fluctuations in the market value of the company's assets. For the purposes of this paper we do not elaborate further on such an approach.

The Pillar 1 Standard Formula for spread risk does not impose any capital charge on sovereign bonds issued by EU member states. Some firms allow for a capital component in respect of the spread risk on such sovereign assets under their Pillar 2 capital calculations. In this case a company could also consider making some allowance for the spread risk mitigation of the VA, thereby reducing the Pillar 2 spread risk component somewhat.

Risk management requirements in the Solvency II Directive

Risk management rules relating to the VA are set out in Articles 44 of the Solvency II Directive.

Firstly, firms are required to set up a liquidity plan projecting the incoming and outgoing cash flows in relation to the assets and liabilities subject to the VA. This involves demonstrating that:

- The firm has adequate understanding, risk mitigation and financial resources to manage the liquidity risk on the business to which the VA is applied.
- The firm has sufficient liquidity to meet claims on an ongoing basis during stressed periods without resorting to selling illiquid assets.
- The possible forced sale of assets under stressed conditions would not have a material effect on the level of Own Funds.

Firms are additionally required to regularly assess:

- The sensitivity of their Technical Provisions and Own Funds to the assumptions underlying the calculation of the VA
- The possible effect of forced sales of assets on their Own Funds.
- The impact of a reduction of the VA to zero.

Such assessments must be submitted in the Regular Supervisory Report (RSR).

Where the reduction of the VA to zero would result in noncompliance with the SCR, a firm must submit an analysis of the measures it could apply in such a situation to re-establish the level of Own Funds covering the SCR or to reduce its risk profile to restore compliance with the SCR.

Although the VA should reduce pro-cyclicality, it also introduces a new risk if the increase in credit spreads is not temporary, or artificial, but is rather a reflection of decreasing creditworthiness and thereby a true solvency decrease should be the consequence. Solvency II addresses this issue by requiring insurers to show their solvency without the VA and to report to their supervisory authorities the potential measures they have at hand to improve their solvency without the VA.

Furthermore, firms should confirm that the application of the VA does not introduce an incentive to engage in pro-cyclical behaviour, where firms invest in risky assets during stable periods (i.e., when the VA is low) in search of higher returns, and are then forced to sell such assets in periods of market volatility (i.e., when the VA is high). This is inherently linked to the need for holding appropriate assets to back liabilities and having sufficient liquidity to avoid the need for forced selling of assets to meet obligations in periods of market stress. The investment strategies should be aligned with the Prudent Person Principle (PPP) and the objectives of the investment strategies should not be impacted by the use of the VA.

Where the VA is applied, the written policy on risk management must comprise a policy on the criteria for the application of the VA which must be reviewed by the board annually. We would expect at least the following key items to be covered in the policy:

- Documentation of the obligations to which the VA is applied
- Contract features considered in the liquidity assessment
- Documentation of the interaction between the investment policy and the application of the VA
- Evidence that the use of the VA does not result in pro-cyclical investment behaviour
- Confirmation that risks introduced by the application of the VA are listed in the risk register
- Requirements to have controls in place to manage the operations of application of the VA
- A process for the assessment of the application of the VA to new products

ORSA

Article 45 of the Solvency II Directive requires firms to perform the assessment within the Own Risk and Solvency Assessment (ORSA), measuring compliance with the capital requirements on a continuous basis with and without taking into account the VA.

If projections suggest that a firm may become dependent on the VA in order to maintain solvency in future years, we would expect the need for such firms to create an action plan setting out the steps which would be taken (and their associated timelines) to maintain or restore solvency in the event that the authorisation to apply a VA were to be withdrawn.

9. VA landscape across Europe

Collectively the extrapolation of the risk-free interest rate term structure (including the LLP and UFR), the MA, the VA, the Transitional Measure on Technical Provisions (TTP) and the Transitional Measure on Risk-Free Rate (TRFR) are known as the Long-Term Guarantee (LTG) measures. The VA is the most widely used item of the LTG measures although it does not have the greatest impact on balance sheets across the range of measures. The TTP and the MA have greater overall impacts.

EIOPA stated⁸ that 2,912 insurance and reinsurance undertakings were under Solvency II supervision as at the end of 2017 in the EEA insurance market. Of those, 696 companies in 23 countries were using the VA, which covered 66% of EU-wide TPs. In comparison, the MA was applied by only 34 companies and limited to Spain and the UK (although this still relates to 15% of total EU-wide TPs and has a very large impact on the solvency ratio for such companies).

According to the EIOPA statistics at the end of 2017, removal of the VA reduces the overall solvency ratio of EU insurance undertakings from 239% to 230%. Excluding undertakings that do not use the VA at all, the equivalent average solvency ratio falls from 239% to 222%. It is worth noting that the impact of removing the VA is typically larger than the impact of the VA moving to zero as a result of contracting spreads, due to there being no offsetting benefit from increases in asset prices under the removal of the VA scenario.

The absolute impact of the VA, MA, TTP and TRFR on the whole EEA market is set out in the table in Figure 9. For the whole market, removing the measures would increase the amount of TPs by €176 billion. Own Funds to cover the SCR would reduce by €126 billion and the SCR would increase by €64 billion.

FIGURE 9: IMPACT OF LTG MEASURES AT DECEMBER 2017

SCALE – BILLION EUROS	AMOUNT WITH MA, VA, TRFR AND TTP	IMPACT OF REMOVING THE MEASURES					AMOUNT WITHOUT MA, VA, TRFR AND TTP
		IMPACT OF TTP	IMPACT OF TRFR	IMPACT OF VA	IMPACT OF MA	IMPACT OF ALL MEASURES	
Technical Provisions	9,125	119	1	13	43	176	9,301
Eligible Own Funds to cover the SCR	1,614	-84	-1	-5	-36	-126	1,488
SCR	675	6	0	24	34	64	739
Eligible Own Funds to cover the MCR	1530	-86	-1	-7	-36	-129	1,401
MCR	236	2	0	6	8	16	253

Source: EIOPA

The six largest markets by size of TPs are the UK, France, Germany, Italy, the Netherlands and Ireland. We now highlight the impact of the VA across those countries.

The table in Figure 10 shows the average impact of removing the VA on the solvency ratios of undertakings using the VA measure (defined as Own funds / SCR).

FIGURE 10: IMPACT OF THE VA ON SOLVENCY RATIOS (AS AT DECEMBER 2017)

COUNTRY	SOLVENCY RATIO WITH VA	SOLVENCY RATIO WITHOUT VA
UK	165%	162%
France	216%	202%
Germany	363%	325%
Italy	244%	238%
Netherlands	184%	142%
Ireland	161%	158%

⁸ EIOPA (21 December 2018). Report on Long-Term Guarantee Measures 2018, ibid.

Source: EIOPA

Within this group of countries the average change in SCR ratios is the highest for undertakings in Germany and the Netherlands. This results from the fact that the impacts on SCR are significantly higher for those countries, owing to the nature of the long-term guarantees sold in those markets as well as the use of the DVA by some Internal Model firms. We note that the UK's PRA is now accepting applications from internal model firms to include a DVA following its issuance of updated rules in October 2018. Therefore, in future it may be expected that the impact of the VA will increase for UK undertakings.

The table in Figure 11 shows the corresponding movements in components of the balance sheet and capital when the VA is removed.

FIGURE 11: IMPACT OF THE VA ON TPS, SCR AND OWN FUNDS (AS AT DECEMBER 2017)

COUNTRY	CHANGE IN TPS	CHANGE IN SCR	CHANGE IN OWN FUNDS
UK	0.3%	0.7%	-1.0%
France	0.2%	6.2%	-0.4%
Germany	0.1%	11.4%	-2.9%
Italy	0.1%	1.6%	-0.5%
Netherlands	0.4%	27.5%	-1.7%
Ireland	0.2%	0.6%	-1.5%

Source: EIOPA

The impact of the VA should be interpreted in the light of the level of the observed spreads in the financial markets. The overall impact of the VA was greater as at end 2016 according to EIOPA's 2017 LTG Report reflecting higher spreads at that time. In particular, the size of the VA as at year end 2017 for the Euro was 4bps whereas as at year end 2016 it was 13bps.

In its 2017 LTG Report, EIOPA highlighted some lack of transparency around public disclosure in SFCRs on the use of the VA by companies. Some stakeholders have expressed interest in additional public disclosure. For example:

- The solvency ratios with and without the measures as the quantitative templates currently only provide the Own Funds and SCRs separately with and without the measures.
- The impact of the use of the VA by product or line of business.
- Information on the liquidity policy of the undertaking and the size of the VA it would have if it was calculated on the basis of the undertaking's own assets instead of the assets of a portfolio representative for the market.

10. EIOPA's thematic focus on risk management

As part of its 2018 LTG Report, EIOPA carried out a thematic review on risk management aspects firms undertake in view of the specific requirements on the LTG measures in Articles 44 and 45 of the Solvency II Directive described above in Section 8.

EIOPA provided a questionnaire to NSAs to capture the relevant information that undertakings have provided in their RSRs. A number of general insufficiencies were mentioned by NSAs such as the following:

- It is not yet sufficiently clear what is addressed with "underlying assumptions" as undertakings did sensitivities on the interest rate or spread level but not on the actual building blocks of the VA.
- Information provided tends to be rather general whereas NSAs expect more detailed and quantitative information.
- Where information is provided, judgement on the relevance of assumptions or the sensitivities calculated is often missing.
- Details are generally not reported on how ALM management is performed in practice.

At a more detailed level NSAs made comments about liquidity plans such as the following:

- The projection horizon of liquidity plans varies significantly.
- In most cases, undertakings considered the whole business jointly whereas some cases were identified where planning was performed for distinct homogenous sub-portfolios.

- Some undertakings considered accumulation of shortfalls or surpluses in cashflows rather than just period-by-period mismatches.
- Firms generally analysed adverse business conditions and risk of forced sales. Adverse business conditions include:
 - Changes in interest rates
 - Increased market spreads
 - Downgrades of particular assets
 - Increase in expected claim payments
 - Increase in lapse rates
 - Inflation risk
 - Currency risk

With regards to the required analysis of the sensitivity to the assumptions underlying the VA, NSAs reported that only 51% of sampled undertakings provided such an analysis in their RSRs. Even where such analysis was carried out the NSAs reported a lack of detail. Items considered by undertakings include the following aspects of the VA:

- The composition of the reference portfolio
- The application of the 65% risk-corrected spread factor
- The calculation of the fundamental spread
- An undertaking specific VA
- The impact of variation in spreads
- The impact of variation in the duration of bonds in the representative portfolio

12% of sampled undertakings reported on the possible effect of a forced sale of assets on their Own Funds in the context of the VA. Those undertakings considered scenarios such as a pandemic or liquidity crisis, a mass lapse event or an economic downturn. Some undertakings analysed the proportion of investment assets which can be sold within a short timeframe without losses.

The NSAs also observed the following typical contents within the written policy on the criteria for the application of the VA:

- Undertakings who reported application of the VA with the intention to mitigate temporary movements in market spreads that are not caused by downgrade or default risk. In these cases, they reported that application of the VA reduces the volatility of the solvency position and they intend to only apply the VA in case they are able to earn the VA.
- Undertakings mentioned that they compare the VA with an undertaking specific VA reflecting their own asset mix and decide on this basis whether to apply the VA.
- A number of undertakings outlined that to apply the VA depends on a certain pre-defined risk appetite or liquidity risk indicator.
- Other undertakings reported to only apply the VA where it has sufficient liquid assets to meet its obligations, including the consideration of stressed conditions.
- The duration of the insurance liabilities is considered relevant for the application of the VA by other undertakings. The VA is only used where the duration exceeds a predefined limit or where the duration of the insurance liabilities is similar to the duration of the assets.
- It was also observed that undertakings included in their written policy, measures that are intended to be taken in case of non-compliance with the SCR.

The NSAs noted that undertakings typically did not address how they apply the VA in the case where the VA turns out to be negative.

Only 68% of sampled undertakings provided further detail on the VA in their ORSA.

APPENDIX 1: VA calculation methodology

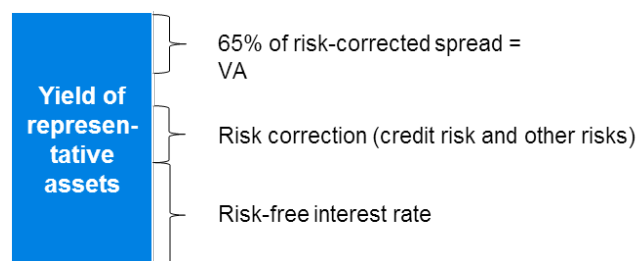
Recital 32 of the Omnibus II Directive stated that 'in order to prevent pro-cyclical investment behaviour, insurance and reinsurance undertakings should be allowed to adjust the relevant risk-free interest rate term structure to mitigate the effect of exaggerations of bond spreads.' For that purpose insurance and reinsurance undertakings can apply the VA to the risk-free interest rate term structure. The VA is based on 65% of the risk-corrected spread between the interest rate that could be earned from a reference portfolio of assets and the risk-free interest rates without any adjustment. The reference portfolio is representative for the assets which insurance and reinsurance undertakings are invested in to cover their insurance and reinsurance obligations.

In more practical terms 'exaggerations of bond spreads' comes from non-default-related changes in the market values of bond-type assets, i.e., the market value of the assets can vary due to market movements other than default risk (for example, liquidity changes). However, because insurance companies may hold their assets for the long term, the Solvency II rules allow that firms' Own Funds do not vary according to such temporary changes by adding a spread to the liability discount rate to counteract movements in asset values. This also avoids the pro-cyclicality phenomenon whereby otherwise firms would be forced to buy more of the same types of assets as those that are falling in value.

A currency-specific reference portfolio is used to determine the portfolio yield spread over the relevant risk-free rate less the portion related to default or credit risk—the result of the calculation being referred to as the 'risk corrected currency spread.' The portion related to default or credit risk is referred to as the 'risk correction' and is based on a percentage of the long-term average spreads (LTAS) observed over the past 30 years. (In the case of corporate bonds the risk correction also reflects 'probability of default' and 'cost of downgrade' factors.) The risk correction is described in the Omnibus II Directive as 'the portion of the spread that is attributable to a realistic assessment of expected losses, unexpected credit risk or any other risk, of the assets' in the reference portfolio. (Furthermore, the risk correction is the same as the 'fundamental spread,' which is the terminology used under Solvency II in the context of the MA.) The risk-free rate is then be adjusted by 65% of the risk-corrected currency spread in discounting liabilities, the adjustment being the 'currency volatility adjustment.'

For example, if the spread of a currency-specific reference portfolio above the risk-free rate is 1.00%, of which 0.25% relates to credit risk, the risk-corrected currency spread would be 0.75% (1.00% - 0.25%). The undertaking would be able to allow for 65% of this as a volatility adjustment. Therefore, in this case, the undertaking would be able to add 0.4875% to the risk-free rate (0.75% * 65%).

FIGURE 12: DERIVING THE VA RATE



In addition, where the spread of a country-specific reference portfolio is at least 100 bps above the risk-free rate and exceeds twice the spread of the currency-specific reference portfolio, then the VA is increased for products sold into that market. The increase is set to equal 65% of the excess of the national spread over twice the currency spread.

For example, if the spread of a currency-specific reference portfolio above the risk-free rate was 1.00% as above, and the country-specific reference portfolio had a spread above the risk-free rate of 2.50%, the country-specific rate would meet both of the requirements outlined above. That is, it would be more than 100 bps above the risk-free rate and the spread would be more than twice the spread on the currency-specific reference portfolio. In this case, the amount by which the country-specific spread exceeds twice the currency-specific spread is 0.50% (2.50% - [1.00% * 2]). Therefore, the undertaking would be able to add an additional country-specific VA of 0.325% to the risk-free rate (0.50% * 65%). In this example, the total VA would be 0.8125% (0.4875% + 0.325%).

A formulaic representation of the calculations is set out as follows:

The currency VA is calculated as:

$$VA_{crncy} = 0.65 \cdot S_{crncy}^{RC}$$

where S_{crncy}^{RC} is the risk-corrected currency spread given by:

$$S_{crncy}^{RC} = S - RC$$

where S is the currency spread and RC is the risk correction based on the reference portfolio:

$$S = w_{gov} \cdot \max(S_{gov}, 0) + w_{corp} \cdot \max(S_{corp}, 0)$$

$$RC = w_{gov} \cdot \max(RC_{gov}, 0) + w_{corp} \cdot \max(RC_{corp}, 0)$$

where:

w_{gov} denotes the ratio of the value of government bonds included in the reference portfolio of assets for that currency and the value of all the assets included in that reference portfolio.

S_{gov} denotes the average currency spread on government bonds, loans and securitisations included in the reference portfolio of assets for that currency.

w_{corp} denotes the ratio of the value of bonds other than government bonds, loans and securitisations included in the reference portfolio of assets for that currency or country and the value of all the assets included in that reference portfolio.

S_{corp} denotes the average currency spread on bonds other than government bonds, loans and securitisations included in the reference portfolio of assets for that currency.

RC_{gov} denotes the risk correction corresponding to the portion of the spread S_{gov} that is attributable to a realistic assessment of the expected losses, unexpected credit risk or any other risk.

RC_{corp} denotes the risk correction corresponding to the portion of the spread S_{corp} that is attributable to a realistic assessment of the expected losses, unexpected credit risk or any other risk.

The country spread, risk correction and risk-corrected country spread are calculated in the same way as the currency spread, but are based on the inputs stemming from the country representative portfolio as opposed to the overall currency.

Where the risk-corrected country spread is greater than 100 bps, the overall VA is calculated as:

$$VA_{Total} = 0.65 \cdot (S_{crncy}^{RC} + \max(S_{country}^{RC} - 2 \cdot S_{crncy}^{RC}, 0))$$

otherwise:

$$VA_{Total} = VA_{crncy}$$

The risk correction for corporate bonds is defined as:

$$RC_{corp} = \text{Max}(PD + CoD, 35\% \cdot LTAS)$$

where:

PD = the credit spread corresponding to the probability of default on the assets

CoD = the credit spread corresponding to the expected loss resulting from downgrading of the assets

LTAS = the long-term average of the spread over the risk-free interest rate of assets of the same duration, credit quality and asset class

The PD and CoD spreads are calculated by projecting credit downgrades and defaults over time using a transition matrix with fixed assumptions for the recovery rate of bonds on default, and scaling factors used to calculate the cost of downgrades. The LTAS is based on long-term average spreads observed over a period of 30 years (as defined in Article 54 of the Solvency II Delegated Acts).

The inputs to the risk correction calculation are typically stable. The transition matrix is based on data obtained from Standard & Poor's from 1987 onwards and is hence a long-term average that is updated annually. The recovery rates and scaling factors used for cost-of-downgrade calculations are set out within the Solvency II Delegated Acts and are therefore considered to be fixed and are not considered further within this analysis. The LTAS is by construction a long-term average value. As the inputs to the risk correction calculation are relatively stable the value of the risk corrections tends to be stable also.

For government bonds the risk correction is defined (as per Article 51 of the Solvency II Delegated Acts, which refers to Article 77c (2) of the Solvency II Directive) as:

$$RC_{gov} = 30\% \cdot LTAS \text{ for exposures to governments and central banks of EU member states}$$

$$RC_{gov} = 35\% \cdot LTAS \text{ for exposures to all other governments and central banks}$$

where LTAS is the long-term average spread of the government bonds.

Again, as this figure is based on a long-term average over a 30-year period the value tends to be stable to a much greater degree than the spreads on the assets themselves.

Appendix 2: Pillar 1 impact of VA

In this section we describe how application of the VA may affect different parts of the Pillar 1 solvency and capital requirements across Technical Provisions including the Risk Margin as well as the Standard Formula SCR before touching on particular considerations with regards to internal model companies.

Best estimate liabilities

The VA directly affects the calculation of the BEL and the TPs. But the impact of the VA on the financial position of insurance and reinsurance undertakings is not restricted to a change in the amount of TPs. The change in TPs itself can also have an impact on other items of the balance sheet and on the SCR and Own Funds.

Removing the VA usually decreases the relevant risk-free interest rates used to calculate the TPs and consequently in most cases increases the TPs by means of lower discounting effects. Apart from the discounting effect the VA may also impact some assumptions made in the calculation of TPs, for example about the amount of future discretionary benefits of insurance with profit participation.

Where removing the VA increases the amount of TPs this increase in liabilities may be accompanied by a decrease of net deferred tax liabilities.

SCR

The SCR is calculated assuming the VA is in place but the VA percentage is assumed not to change within the defined SCR stresses, in particular for the interest rate shock and the spread shock. Nonetheless the presence of the VA in the valuation of TPs will have a second-order impact on SCR calculations.

Risk Margin

Note that the application of the VA does not have an impact on the Risk Margin as the Solvency II legislation requires that the Risk Margin be calculated assuming that the VA is not applied. This is further clarified in Guideline 2 of EIOPA's 'Guidelines on the implementation of the long-term guarantee measures.' This clarification relates to both the projection of future SCRs and the discounting of the cost of capital.

Internal models

With regard to the use of internal models to calculate the SCR, two different treatments of the VA can be observed, the modelling of a constant VA and the modelling of a dynamic VA (DVA).

The use of a DVA permits firms to allow the size of the VA to change when modelling credit spreads in their SCR calculations.

The modelling of a DVA typically results in a significantly lower SCR for spread risk.

The DVA may be particularly relevant for long-term business that is ineligible for use of the MA, for example non-life, with-profit and long-term health liabilities. Use of the DVA may also permit more flexible investment strategies with more freedom to take on credit and government spread risk in backing liabilities.

At end 2017, nine NSAs commented that they would allow undertakings using internal models to apply the DVA, and EIOPA reported the number of undertakings doing so as shown in Figure 13.

FIGURE 13: USE OF DVA BY INTERNAL MODEL FIRMS

COUNTRY	LIFE	NON-LIFE	COMPOSITE	REINSURANCE	TOTAL
Austria	1	1	0	0	2
Belgium	0	1	1	0	2
Czech Republic	0	0	1	0	1
France	5	7	2	1	15
Germany	11	11	1	1	24
Italy	1	0	1	0	2
Netherlands	4	2	0	1	7
EEA Total	22	22	7	3	53

Source: EIOPA

The NSA from Ireland would also allow for the use of the DVA but had not received applications for approval.

In November 2017 EIOPA provided an opinion⁹ in which it identified that DVA is an area where supervisory convergence needs to be reinforced.

In turn, in April 2018 the UK's PRA issued a consultation paper¹⁰ in which it sets out its proposal to consider applications from internal model firms to include a DVA. At Milliman we prepared a separate detailed briefing note¹¹ on the PRA's proposals. Subsequently in October 2018 the PRA issued its updated set out of rules as outlined in Supervisory Statement SS9/18.¹²

⁹ EIOPA (30 November 2017). Opinion on the Supervisory Assessment of Internal Models Including a Dynamic Volatility Adjustment. Retrieved 23 January 2019 from https://eiopa.europa.eu/Publications/Opinions/2017-12-20%20EIOPA-BoS-17-366_Internal_model_DVA_Opinion.pdf.

¹⁰ PRA (April 2018). Solvency II: Internal Models – Modelling of the Volatility Adjustment. Consultation Paper CP9/18. Retrieved 23 January 2019 from <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/consultation-paper/2018/cp918.pdf?la=en&hash=163D2DC4F83622829D0D1180088E501B57C44B8E>.

¹¹ Bugg, R. & Wrobel, L. (20 April 2018). PRA's Consultation Paper on Modelling of the Volatility Adjustment for Internal Model Firms. Milliman Briefing Note. Retrieved 23 January 2019 from <http://www.milliman.com/insight/2018/PRA-Consultation-Paper-on-modelling-of-the-volatility-adjustment-for-internal-model-firms/>.

¹² PRA (October 2018). Solvency II: Internal models – Modelling of the Volatility Adjustment. Supervisory Statement SS9/18. Retrieved 23 January 2019 from <https://www.bankofengland.co.uk/prudential-regulation/publication/2018/solvency-ii-internal-models-modelling-of-the-volatility-adjustment-ss>

Appendix 3: Sample liability valuations

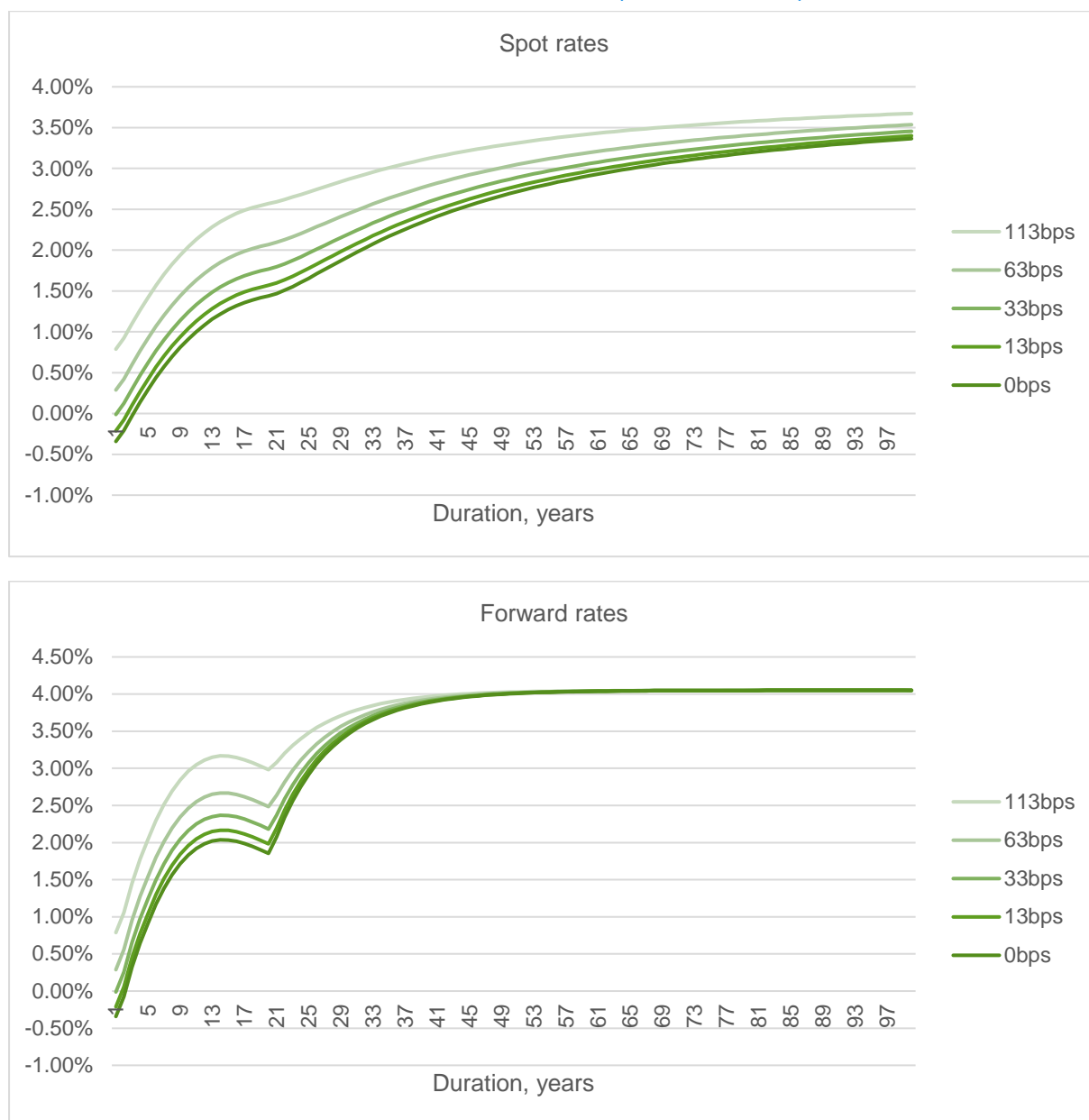
In this section, we look at the extrapolated term structures for the Euro as well as the impact on the time value of money across varying levels of the VA as at end September 2018 market conditions.

It is assumed throughout that the basic risk-free interest rate curve reflects a UFR equal to 4.05%, a credit risk adjustment of 10bps, a last liquid point of 20 years with convergence to the UFR by year 60, and Euro swap market interest rate conditions as at end September 2018.

Impact on term structures

Figure 14 shows the risk-free interest rate term structures for the Euro, calculated for a range of values of the VA (shown for both spot rates and forward rates), in particular, at VA levels of 13bps (the actual VA level observed at end September 2018), 33bps, 63bps and 113bps as well as without any VA.

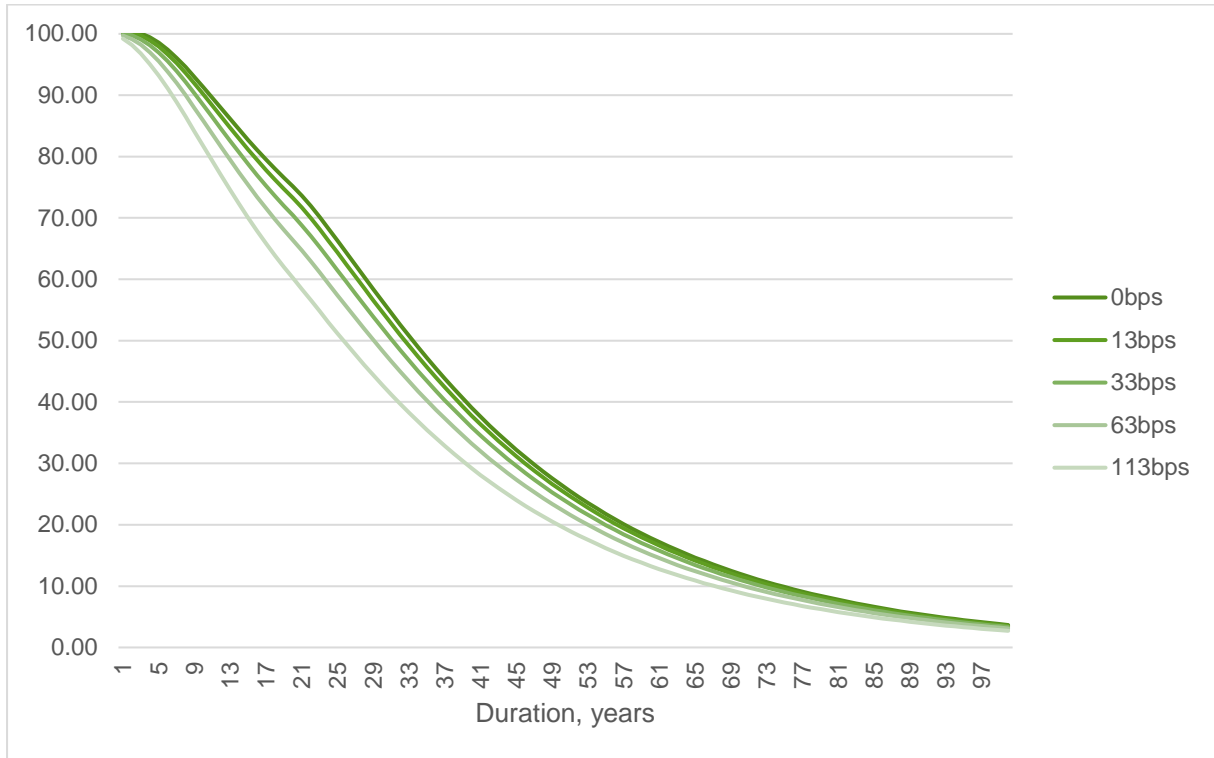
FIGURE 14: EURO RISK-FREE TERM STRUCTURE AT 30 SEPTEMBER 2018 (VARYING VA LEVELS)



Impact on time value of money

Figure 15 shows the discounted value of a future payment of €100 at different durations (time value of money) across the same levels of the VA as above.

FIGURE 15: TIME VALUE OF MONEY AT END SEPTEMBER 2018 (VARYING VA LEVELS)



APPENDIX 4: EIOPA work on the VA

The 2009 Solvency II Directive specified that the TPs should be calculated using a risk-free interest rate term structure. The 2014 Omnibus II Directive went on to further specify that the risk-free interest rate term structure should be extrapolated beyond the LLP and introduced the MA and VA. EIOPA was charged with the detailed specifications of such arrangements on an ongoing basis. EIOPA set out its latest approach to the VA in January 2018.

As well as collection of current market data relating to the risk-free rates and spreads, the derivation of the VA requires decisions by EIOPA on the following items:

- The range and granularity of asset classes, credit quality steps and durations for which the risk corrections of the volatility adjustment are calculated.
- The source data for the probability of default calculation.
- The method of deriving the probability of default from source data.
- The source data for the cost of downgrade calculation.
- The method of deriving the cost of downgrade from source data.
- The source data for the LTAS calculation.
- The method of constructing missing data of the 30-year spread history.
- The treatment of currencies for which source data are not available.

EIOPA intends to update the representative portfolios at the end of each year, on the basis of the annual supervisory reporting of insurance and reinsurance undertakings and of insurance groups. The weights and durations of the representative portfolios are set out in the Excel files of the monthly publication of the risk-free interest rate term structures on EIOPA's website.

We now consider key components of the Currency VA for the euro as at 30 June 2018.

- The split of weights applying to sovereign bonds, other assets relevant to the VA and other assets allocated zero impact for the purposes of the VA are shown in Figure 16 (other major currencies are shown for comparison):

FIGURE 16: AGGREGATE WEIGHTINGS OF REFERENCE PORTFOLIOS

CURRENCY	SOVEREIGN BONDS	OTHER ASSETS	
		RELEVANT TO VA	OTHER ASSETS
EUR	32.8%	40.5%	26.7%
GBP	23.2%	31.0%	45.8%
JPY	51.3%	6.7%	42.0%
USD	17.0%	55.8%	27.2%

Source: EIOPA

This means that, other things being equal, an upwards spread movement in sovereign bond yields of 1% would equate to a 0.328% increase in the VA (although the risk correction may increase somewhat to offset this).

- In turn, the weights and durations in relation to the underlying sovereign bonds by euro currency member state are shown in Figure 17.

FIGURE 17: COUNTRY WEIGHTS OF EURO REFERENCE PORTFOLIO

COUNTRY	WEIGHT	DURATION, YEARS
Austria	4.0%	9.3
Belgium	8.0%	10.0
Finland	1.0%	10.1
France	30.0%	9.5
Germany	14.0%	10.4
Ireland	1.0%	7.5
Italy	24.0%	6.9
Luxembourg	1.0%	10.1
Netherlands	4.0%	11.0
Poland	1.0%	7.1
Portugal	1.0%	5.1
Slovakia	1.0%	7.9
Spain	10.0%	8.9

Source: EIOPA

There was a weighting of 10% or more each for France, Germany, Italy and Spain sovereign bonds.

Furthermore, a large part of the government bond portfolio comprises AA-rated French government bonds and BBB-rated Italian government bonds.

- Likewise, the composition of the portfolio of non-sovereign assets relevant to the VA are shown in Figure 18 (the index numbers 0 to 6 represent credit risk rating groups).

FIGURE 18: NON-SOVEREIGN WEIGHTS OF EURO REFERENCE PORTFOLIO

ASSET TYPE	WEIGHT	DURATION, YEARS
Financials_0	18.0%	7.3
Financials_1	12.0%	6.8
Financials_2	20.0%	5.4
Financials_3	12.0%	5.3
Financials_4	1.0%	4.1
Financials_5	1.0%	4.5
Financials_6	0.0%	n/a
NonFinancials_0	2.0%	9.8
NonFinancials_1	7.0%	7.6
NonFinancials_2	11.0%	6.2
NonFinancials_3	15.0%	5.4
NonFinancials_4	1.0%	4.1
NonFinancials_5	0.0%	n/a
NonFinancials_6	0.0%	n/a

Source: EIOPA

Note that two-thirds of the corporate bond portfolio is financials, which have had large historical spread movements compared to other bond categories.



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