How to deal with volatility under Solvency II

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Solvency II is the prudential regime applicable to all EU insurance companies since January 2016. The Solvency II ratio compares the own funds available with the risks an insurer is exposed to, also called the Solvency Capital Requirement (or SCR, which is calibrated at the value-at-risk 99.5% over a one-year horizon). It ensures that an undertaking with a ratio higher than 100% does not default over the coming year with a probability of more than 0.5%.

The valuation underlying the own funds and the stressed scenarios underlying the SCR calculations are based on market consistency. The advantage is the clear link to up to date economic and financial assumptions applied in a consistent way to all insurers, which gives supervisors early warnings on insurers in distressed situations. The disadvantage is the resulting excessive volatility, especially for long-term insurance business, that could hamper financial stability and long-term products offering.

The purpose of this article is to contribute to the reflexions to the long-term guarantee review and equity risk measures from EIOPA by 2020 to find an appropriate balance between policyholder protection and proper functioning of the financial and insurance markets.

We start by analyzing the long-term measures applicable to the risk-free rate, namely the **Volatility Adjustment** (**VA**) and the **Matching Adjustment** (**MA**) that are added as a parallel shift on top of the risk-free rate[1] and reduces the Best Estimate of insurance Liabilities.

We then introduce the concept of **Own VA** assessment where the VA is calculated starting from the assets and taking into account the assets and liabilities interactions of a specific insurer. Such an assessment could be part of the governance system under pillar 2 of SII.

Without being exhaustive, we consider other possible adjustments for long-term business such as:

– the **Extended Matching Adjustment** (**EMA**) where the strict conditions to apply the MA are relaxed but an application ratio reduces the MA to take into account cash flow uncertainty;
– a **Reduced Capital Charge for Long Term Equity** (**SCR LT Equity**) where the capitalized dividends over time would reduce the risk as a function of the holding period.

We end up with the illustration of those possible adjustments on a **simplified example** before concluding on the key takeaways.

Adjustments to the risk-free curve: MA and VA

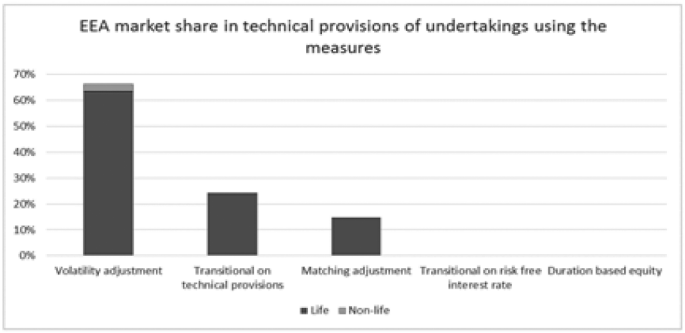
Context and impact

Long-term guarantees (LTG) measures are supposed to mitigate any excessive impact of short-term market movements with respect to insurance business of a long-term nature and are closely followed up given their significant impact:

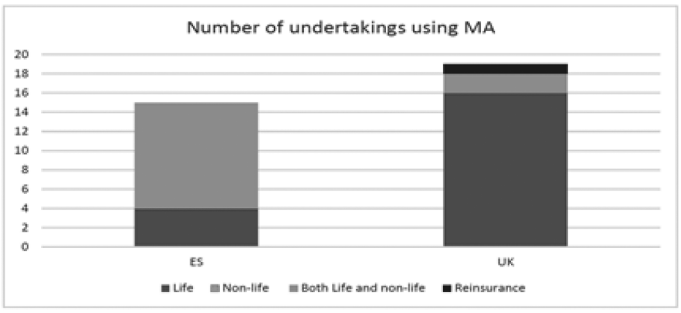
– the EC agenda includes the review of the LTG measures by 2021;
– EIOPA reports annually on the impact of the LTG package and equity risk measures.

We will analyze the impact of the LTG measures with a specific focus on the adjustments to the risk-free curve as indicated in the 2018 report based on EOY17 data[2]:

1. Up to the Last Liquid Point under the VA.
2. Source: EIOPA, Dec 2018, https://eiopa.europa.eu/Publications/Reports/2018-12-18%20_LTG%20AnnualReport2018.pdf.



- 75% of the EEA technical provisions are subject to one of those measures;
- *66%* apply the *VA*
- *15%* apply the *MA*



- Only Spain and UK apply the MA (34 undertakings)
- The *MA average* value ranges to approx.:
  - *95 bp (UK)* (110 bp EOY16)
  - *70 bp (ES)* (75 bp EOY 16)
- The *VA (EOY16) = 4 bp* (13 bp EOY 16)

Following table provides an overview of the impact of the different measures:

	Amount with MA, VA, TRFR and TTP (billion euro)	Impact of removing the measures (billion euro)					Amount without MA, VA, TRFR, and TTP (billion euro)
		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
Basic own Funds	1 601	-83	-1	-7	-35	-127	1 475
Excess of assets over liabilities	1 554	-91	-1	-8	-36	-137	1 417
Restricted own funds due to ring-fencing and matching portfolio	19	-6	0	-1	-2	-9	10
Eligible own funds to cover the SCR	1 614	-84	-1	-5	-36	-126	1 488
Tier 1	1 510	-86	-1	-7	-36	-130	1 380
Tier 2	96	1	0	1	-1	1	97
Tier 3	8	1	0	1	1	3	11
SCR	675	6	0	24	34	64	739
Eligible own funds to cover the MCR	1 530	-86	-1	-7	-36	-129	1 401
MCR	236	2	0	6	8	16	253

- The major impact is related to the TTP measure (119 out of 176)
- MA is less frequently used but has a significant impact:
  - Removing the VA would lead to an average SII ratio decrease of 9 percentage points
  - Removing the MA would lead to an average SII ratio decrease of 16 percentage points
- Removing those measures would lead to:
  - EOF decrease by 129 bn € and SCR increase by 64 bn €
  - an average SII ratio decrease of 38 percentage points (from 239% to 201%)

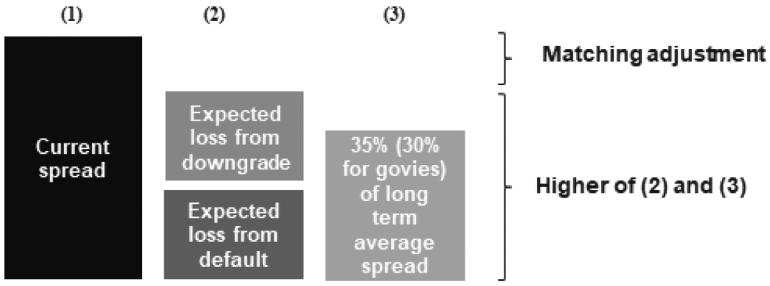
The MA is much less used than the VA (only 34 undertakings located in the UK and Spain) but has a significant impact given its average magnitude (70/95 bp versus 4 bp for the VA).

Definition of the matching adjustment (MA)

Descriptions

- Adjustment to the discount rate used to value **life insurance obligations and annuities stemming from non-life contracts**
- Applicable if assigned portfolio of assets is **managed separately**
- The portfolio of assigned assets has **fixed cash flows**
- The matching adjustment of sub-investment grade assets is capped at the MA of BBB assets
- **Immaterial underwriting risks** are accepted (mortality risk < 5% of BE), no surrender option (or option < MVA)
- No future premium payments

Calculation Methods



Definitions

Current spread = $IRR(MVA; CF\ liabilities) - IRR(BEL; CF\ liabilities)$

The spread of the investment return over the risk-free rate shall be equal to **the difference** of the following:

- The annual effective rate, calculated as the single discount rate that, where applied to the **cash-flows of the portfolio of insurance obligations**, results in a value that is equal to the **market value of the assigned assets**
- The annual effective rate, calculated as the single discount rate that, where applied to the **cash-flows of the portfolio of insurance obligations**, results in a value that is equal to the value of the **best estimate of the portfolio of insurance obligations**

Fundamental spread/Risk Corrected spread

The fundamental spread is the maximum of 2 and 3 in the figure above. EIOPA shall publish a fundamental spread for each asset class (duration, credit quality) on at least a quarterly basis

Definition of the Volatility Adjustment (VA)

Descriptions

- The Volatility Adjustment is **applied to the liquid zero coupon rates** of the Basic Risk Free curve, the final discount curves provided by EIOPA show a parallel shift until the LLP. There is no parallel shift after the LLP as the curve with and without volatility adjustment ultimately converge to the same UFR
- Calculated by currency zone, but with an **exceptional national adjustment** in exceptional market circumstances
- The amount of the Volatility Adjustment should be assumed to be **the same before and after the application of an SCR shock**

Calculation Methods

If normal conditions :

Volatility Adjustment = 65% × Risk corrected currency spread

If exceptional circumstances :

Volatility Adjustment = 65% × (Risk corrected currency spread + Add-on)

Definitions

Risk corrected currency spread

- Using a reference portfolio specific to the currency in order to calculate the spread over risk-free rate adjusted for the part due to default risk

Risk corrected national spread

- Using a reference portfolio specific to the country to calculate the spread over risk-free rate adjusted for the part due to default risk

Add-on

- Add-on = $(risk\ corrected\ national\ spread - 2 \cdot risk\ corrected\ currency\ spread)$

Exceptional circumstances

- The spread of the national reference portfolio is at least twice the spread of currency specific portfolio, and
- The spread of the national reference portfolio is greater than 100bps

Comparing MA and VA

Dimension	MA	VA
Distinct conditions	° Assets replicating predictable liabilities and managed separately ° Make undertakings immune to spread movements given held to maturity approach ° Undertaking specific	° Long-term liabilities not subject to MA or other transitional measure ° Applicable under stressed fixed income market conditions to avoid pro-cyclical behavior ° Calculated by EIOPA on a monthly basis
Common conditions	° Supervisor approval, liquidity plan required ° Disclosure on removing the measure	
Calibration	° Current spread at undertaking level ° Risk correction based on EIOPA data	° Risk corrected spread at EU representative portfolio level (possible national corrections under extreme circumstances)
Formula – adjustment on risk-free curve	° MA = IRR(MVA;CF liabilities) – IRR(BEL;CF liabilities) – Risk Corr ° This is equivalent to the difference of the yield between assets and yield between liabilities after correction for credit risk ° In contrast to the VA where a 65% ratio applies, the full adjustment can be recognized given the replication strategy	° ***VA* = 65%** (***Spread*$_{portfolio}$ – *Risk Corr*$_{portfolio}$**) ° The calibration on a EU representative portfolio can lead to a significant basis risk given the different national investment strategies at EU level ° There is no formal technical documentation underlying the 65% ratio
Formula – SCR spread	° Reduced capital charge given MA increase: MVA* : reduced assets value after spread stress Risk Corr* = Risk Corr + CS* reduction factor; where the reduction factor is a function of the credit quality step MA* = IRR(MVA*; CF liabilities) –IRR(BEL; CF liabilities) – Risk Corr*	° No impact under the standard formula: VA remains constant ° Possibility to use a dynamic VA under internal model after supervisor approval (VA increase due to changes in spreads, risk correction or in investment behavior)

The strict conditions of the MA result in a very limited application in practice while the basis point correction can be quite significant. This raises the question of whether an intermediate situation could be considered such as the extended matching adjustment under the Long Term Guarantee Assessment exercise or the middle bucket under the International Capital Standard[3].

Introducing the own VA under pillar II

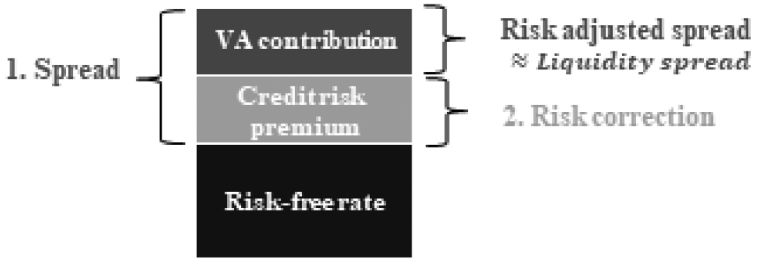
We refer to the article written by Roger Meli, Daphné de Leval and George Garston with the title "Volatility Adjustment under the loop[4]".

The basic idea is to define the value in euros from liquidity premiums in the actual asset portfolio of an insurer and convert it to an adjustment to the risk-free curve taking into account the insurer's liabilities characteristics. While leveraging on EIOPA data, the merit of this approach is that you only need cash flows from assets and liabilities and their respective duration.

The method is thus easy to implement and results in a VA calculation that is insurer specific or "Own VA" which could be used under pillar II as part of the risk management system and foster discussions with supervisors as to the differences with the VA calculated at EU level under pillar I.

Detailed calculation of the VA

The VA calculation of each bond consists of 2 components:
1. Spread component: difference between the bond market yield and the risk-free rate
2. Risk-correction component: difference between the bond market yield and the yield corrected for credit event



3. See https://eiopa.europa.eu/Publications/QIS/A_-_Technical_Specification_on_the_Long_Term_Guarantee_Assessment__Part_I_.pdf; https://www.iaisweb.org/page/supervisory-material/insurance-capital-standard//file/76130/public-2018-field-testing-technical-specifications.
4. See www2.deloitte.com/ch/en/pages/financial-services/articles/volatility-adjustment-under-the-loop.html.

The components at bond level are then aggregated according to the following steps:

1. Aggregation within the government and corporate bonds depending on their relative market value to obtain the spread and risk-correction component per bond type ($Spread_{gov/corp}$, $Risk\ Corr_{gov/corp}$)
2. Application of the weights of the representative portfolios proportion of liabilities covered by fixed-income assets at EEA level ($w_{gov/corp}$) to obtain spread and risk-correction at portfolio level
3. Final VA is 65% of the risk adjusted spread at portfolio level

$$Spread_{portfolio} = w_{gov} \cdot max(Spread_{gov}, 0) + w_{corp} \cdot max(Spread_{corp}, 0)$$

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

$$VA = 65\% \cdot (Spread_{portfolio} - Risk\ Corr_{portfolio})$$

Necessary steps to have a risk management approach for the VA

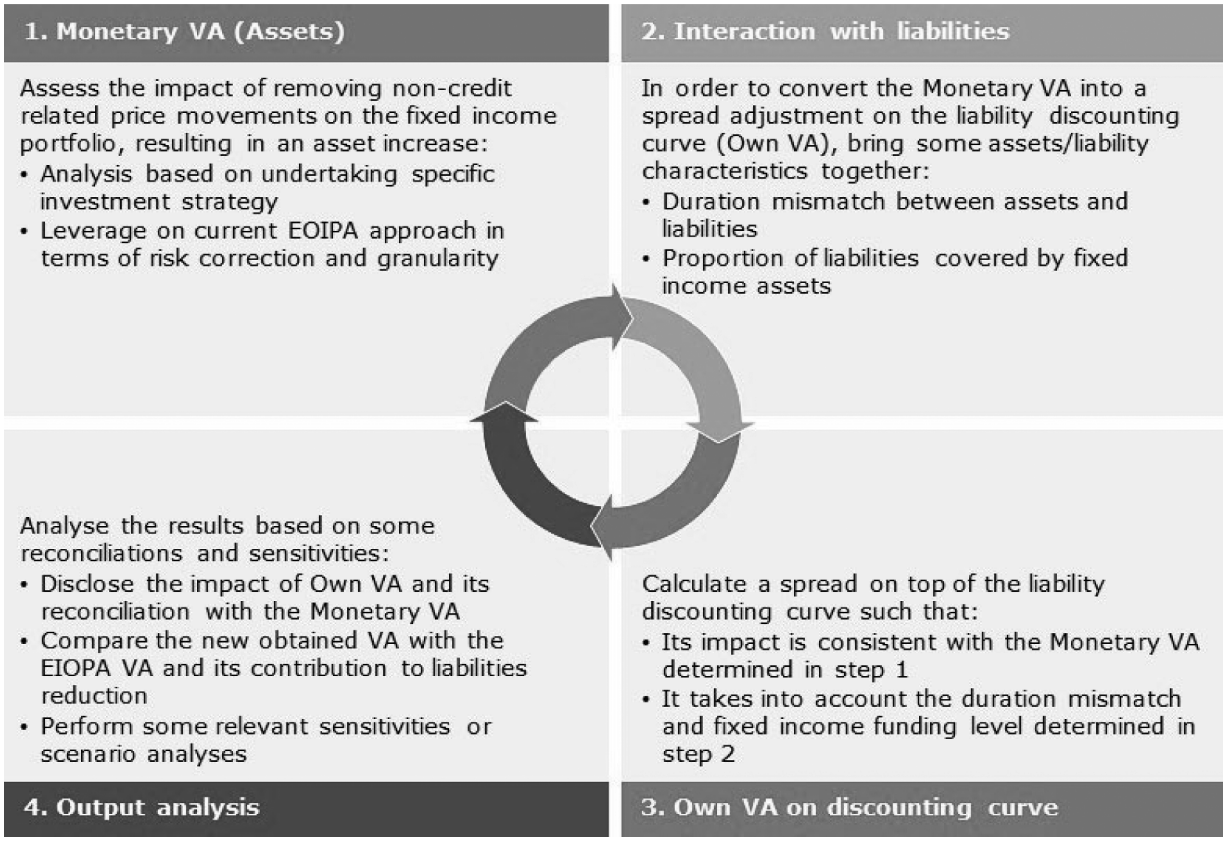
Four deficiencies are identified under the current approach to make the VA "Risk Management compliant" with fully up-to-date data at insurer level:

1. Basis risk: difference between EIOPA generic portfolio and insurer specific portfolio
2. Duration mismatch: duration gap between assets and liabilities is implicitly captured by the 65% factor but is fixed over time and can differ significantly from the insurer situation
3. Funding level of liabilities by fixed-income portfolio: the weights are yearly updated based on aggregated reporting data of the previous year resulting in a time lag
4. Data aggregation issues on EUR government bonds:
   - Yields and long-term average spreads are the same for all EUR bonds rather than being country specific
   - Risk of negative risk adjusted spread for highly rated bonds at country level

→ **Start from the assets: define the monetary impact of removing non-credit related components called "VA monetary impact" and then assess an "own VA" for discounting liabilities**

Underlying concepts of the Own VA

The scheme below illustrates the underlying concepts of the suggested VA approach:



This new methodology has the very advantage of leveraging on the current EIOPA VA approach while promoting a better risk management based on market data and updated undertaking specific assets and liabilities. This also further supports the objective of avoiding excessive volatility in Solvency II and stabilizing capital resources for insurers both from a supervisor and management perspective.

Finally, this method also provides possible synergies with IFRS 17 discounting under the bottom-up approach where the liquidity premium is to be calibrated in line with the liquidity characteristics of insurance contracts.

Calculation of the VA monetary impact

The monetary impact is calculated according to the following steps:

1. ***Determine the Liquidity Spread (risk adjusted spread[5]) at the most granular level while leveraging on EIOPA data:***
   - Government bonds, per country:

$$\text{Liquidity Spread}_{\text{country}} = max\left(\text{Spread}_{\text{gov}}, 0\right) - max\left(30\% \cdot \text{LTA spread}_{\text{gov}}, 0\right)$$

   - Corporate bonds, per type (Financial/Non-Financial) and rating:

$$\text{Liquidity Spread}_{\text{rating, type}} = max\left(\text{Spread}_{\text{rating, type}}, 0\right) - max\left(35\% \cdot \text{LTA spread}_{\text{rating,type}}, \text{PD}_{\text{rating and type}} + \text{CoD}_{\text{rating,type}}\right)$$

2. ***Approximate the corresponding increase in market value:***
   - Underlying assumptions:
     "Single CF assumption" where all CF are assumed to occur at duration:

$$\text{MV} \approx \text{total CF} * \exp\left(-\text{Duration} * (\text{yield})\right) = \text{total CF} * \exp\left(-\text{Duration} * (\text{rfr} + \text{spread})\right)$$

     First order Taylor expansion on the yield variation[6]:

$$\Delta\text{MV} \approx \text{total CF} * \Delta \exp\left(-\text{Duration} * \text{rfr} + \text{spread}\right) \approx -\text{total CF} * \text{Duration} * \Delta\left(\text{rfr} + \text{Spread}\right)$$

     Risk-free rate and credit component of spread remain constant, only removing the liquidity spread is considered:

$$\boldsymbol{\Delta MV \approx total\ CF * Duration * Liquidity\ Spread}$$

   - Application at government/corporate bond level with duration weighted by Market Value:
     - $\text{VA Monetary Impact}_{\text{gov}} = \sum \text{Liquidity Spread}_{\text{country}} \cdot \text{Duration}_{\text{country}} \cdot \text{Total CF}_{\text{country}}$
     - $\text{VA Monetary Impact}_{\text{corp, rating and type}} = \sum \text{Liquidity Spread}_{\text{rating and type}} \cdot \text{Duration}_{\text{rating and type}} \cdot \text{Total CF}_{\text{rating and type}}$

Conversion of the monetary impact into an own VA

The best approach is to increase the market value of assets with the monetary impact from the VA without adjusting the discounting curve. For reconciliation purposes, it is however possible to approximate an own VA

- The decrease in BEL should equal the VA monetary impact:

$$\Delta\text{BEL} = \text{BEL}_{\text{RfR}} - \text{BEL}_{RfR+\text{VA}} = \text{VA Monetary Impact}$$

5. I.e. Spread – risk correction.
6. Noting indeed that: $\Delta e^{-x} \approx -\Delta x$.

– Under the assumption of "single cash flow" at liability duration and first order Taylor expansion[7]:

$$\Delta\text{BEL} = \text{VA Monetary Impact} \approx \text{VA} \cdot \text{dur L} \cdot \text{Total CF Liab}$$

$$\Rightarrow \boldsymbol{VA \approx \frac{\text{VA Monetary Impact}}{dur\ L \cdot Total\ CF\ Liab}}$$

– Equivalently, using the definition of the VA Monetary Impact:

$$\text{VA} \approx \frac{\sum_i \text{Liquidity Spreads}_i \cdot \text{Duration}_i \cdot \text{Total CF Bonds}_i}{\text{dur L}} \cdot \frac{1}{\text{Total CF Liab}}$$

– Defining an average yearly liquidity spread $LS^*$for the global bond portfolio duration dur_B:

$$\text{LS}^* \cdot \text{dur}_\text{B} = \frac{\sum_i \text{Liquidity Spreads}_i \cdot \text{Duration}_i \cdot \text{Total CF Bonds}_i}{\sum_i \text{Total CF Bonds}_i}$$

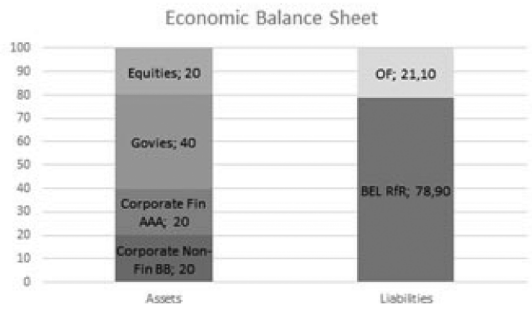
– We can rewrite the relation between VA and average liquidity spread:

$$\Rightarrow \mathbf{VA} \approx \text{LS}^* . \frac{\text{dur}_\text{B}}{\text{dur}_\text{L}} . \frac{\text{Total CF Bonds}}{\text{Total CF Liab}} = \mathbf{LS^*} . \frac{\mathbf{dur_A}}{\mathbf{dur_L}} . \frac{\mathbf{Total\ CF\ Bonds}}{\mathbf{w_B * Total\ CF\ Liab}}$$

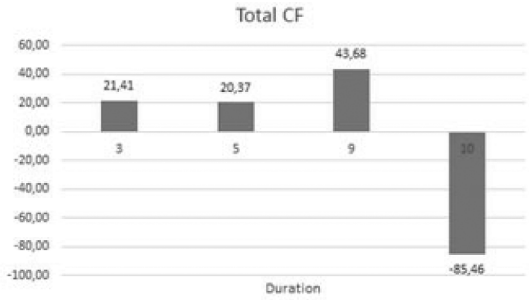
Duration gap — Fixed Income level

Simplified example

Let us consider a simple insurer with single CF liability[8] of 85,46 at duration 10 and the following asset composition:



Discounting the liabilities with the **EIOPA VA of 4bp** by EOY17 would result in a BEL of 78,59, i.e. a **liability decrease of 0,31**



The following information on fixed-income allows us to determine the VA monetary impact:

Bond	MV	Duration	Yield	LS	Total CF	VA Monetary Impact
Government	40	9,0	0,98%	0,18%	43,68	0,72
Corporate Fin AAA	20	5,0	0,37%	0,11%	20,37	0,11
Corporate Non-Fin BB	20	3,0	2,30%	0,75%	21,41	0,48
Total/Average	80	6,5	1,16%	0,31%	85,46	**1,31**

Assuming the full VA monetary impact can be recognized, the corresponding **Own VA would be 15bp:**

$$LS^* = \frac{Monetary\ VA}{Total\ CF * Bond\ duration} = \frac{1,31}{85,46 * 6,5} = 0,24\%.$$

$$Own\ VA = LS^* * \frac{Dur\ A}{Dur\ L} * \frac{Total\ CF\ bonds}{W_B * Total\ CF\ Liab}$$

$$= 0,24\% * \frac{5,2}{10} * \frac{85,46}{80\% * 85,46} = 0,15\%$$

Other possible adjustments for LT business

Two measures are considered here:
– Reduction in Equity capital charge:
– (Re)introducing the concept of extended Matching Adjustment

It is important to note that the presented results in this section are based on preliminary analyses and are indicative only.

7. Those approximations hold true for relatively flat interest rate curves and sufficient small risk-free rate and VA; i.e. $|duration \cdot (RfR_{duration} + VA)| \ll 1$.
8. This example assumes no Risk Margin for simplification purposes.

Possible reduction in SCR Equity for long term holding period

We have performed the following high level analysis:

– Data based on Eurostoxx 50 Price index over Jan 1987 – Oct 2018[9]

– Look at worst-case 1, 2, 5 and 10-year returns at various quantiles

Quantile/ Year	1	2	5	10
Min	-51%	-58%	-52%	-56%
0,50%	-45%	-54%	-49%	-51%
1,00%	-43%	-52%	-46%	-50%
5,00%	-29%	-43%	-39%	-42%
10,00%	-22%	-29%	-31%	-35%
25,00%	-7%	-6%	-13%	-15%
50,00%	10%	14%	26%	77%
75,00%	21%	36%	65%	158%
90,00%	31%	60%	161%	313%
95,00%	38%	74%	204%	364%
99,00%	51%	97%	284%	453%
99,50%	55%	105%	295%	463%
Max	66%	133%	323%	490%

Intuition:

- ***The worst-case loss for a 10-year investment would be significantly higher than as the worst-case loss for a 1-year. Similarly, the best case upside of a 10-year investment would be much greater than the best-case upside for a 1-year investment***

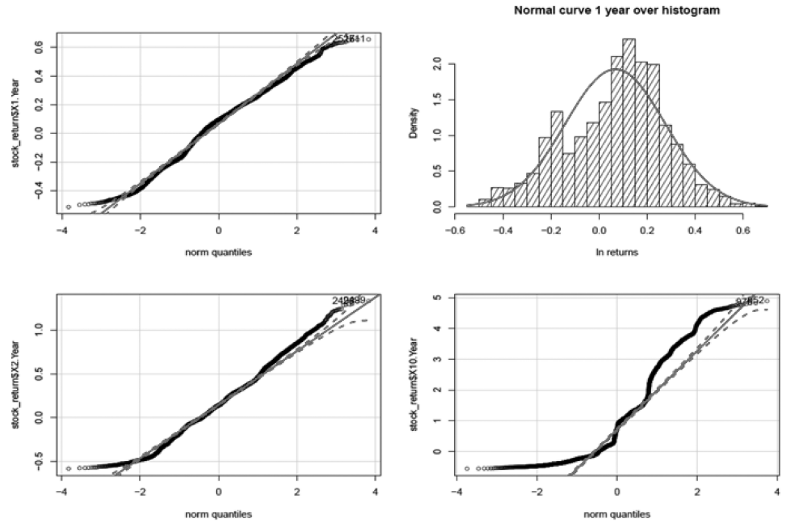
Observation for worst case returns: the values are stable over time showing a similar risk for different holding periods and contradicting the intuition

Observation for best case returns: best 10-year returns are almost 10 times the best 1-year returns in line with intuition

Preliminary analyses:

- The return distributions for investments over longer time horizons are clearly skewed (non-gaussian)
- Long-term investments have a similar price drop risk to 1-year investment, however, allow for capitalisation on the long-term dividend payments

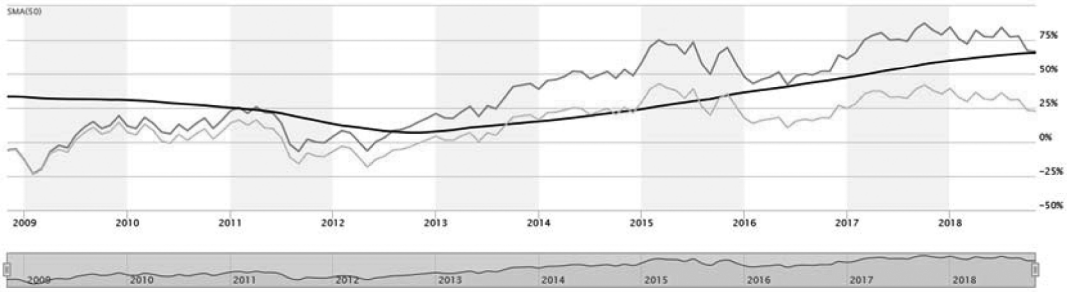
The graphs below indicate that the log-returns over one year appear to be bimodal, not following a Normal distribution. The divergence from normality is even more striking over the years. To calibrate the capital charge, we would therefore opt for the empirical variance:



Below graph illustrates the evolution of 2 indices of the Eurostoxx 50:

– Total Return index (TR) including dividends capitalization: **SX5T index**

– Price index (PR) without dividends: **SX5E index**



9. Type 1 capital charge appears to have been calibrated based on MSCI World Developed index over 136 years (1873-2009). See https://eiopa.europa.eu/Publications/QIS/CEIOPS-Calibration-paper-Solvency-II.pdf#search=filename%3Aceiops-calibration-paper-solvency-ii%2Epdf, pp. 36-41).

The impact of dividends capitalized over time on equity risk profile should be further investigated, potentially resulting in reduced capital charge as a function of holding period horizon.

Defining the ultimate capital charge

Similarly to the duration based approach[10], the following equivalent yearly equity charge for a holding period T could be defined:

1. Assuming log returns are normally distributed:

$$\frac{SCR_T}{S_0} = 1 - exp\left[\left(\mu_T + div_T - \frac{\sigma_T^2}{2}\right) T - \sigma_T \sqrt{T}\, N_{99.5\%}^{-1}\right]$$

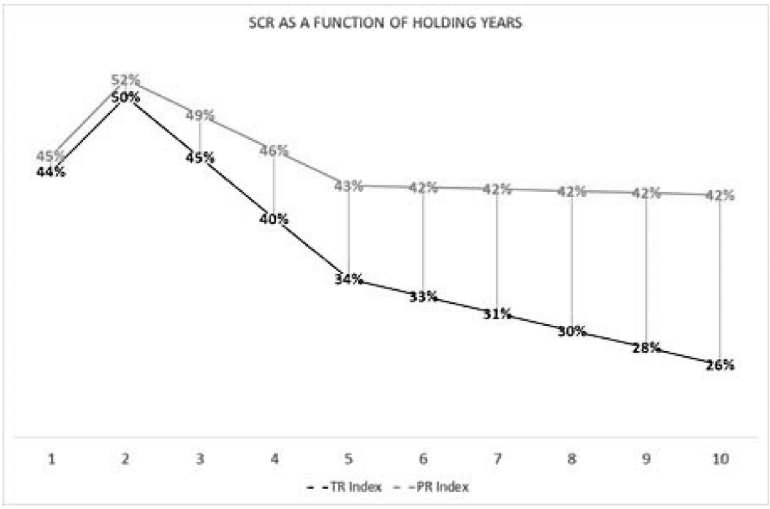
Where:

μ_T is the annual log return of the price index; div_T is the yearly equivalent extra log-return from the dividends over T.

σ_T^2 is the annualized variance of both price and dividend returns over T; $N_{99.5\%}^{-1}$ is the 0.995 quantile of the standard normal distribution

2. Otherwise, it is advisable to use the empirical VAR:

$$\frac{SCR_T}{S_0} = 1 - exp\left[q_{0.5\%*T} ln\left(\frac{TR_t}{TR_{t-T}}\right)\right]$$



The empirical VAR indicates:
- **a stable capital charge over time when dividends are disregarded: quantiles of the Price index remain around 42%**
- **a reduction in risk over time thanks to dividends capitalisation: quantiles of the Total Return index decrease over time**

The empirical VAR is data sensitive[11] and further investigation is required but assuming a linear extrapolation, our preliminary analysis suggests that the capital charge could be reduced to 22% for a 12 year holding period thanks to dividends capitalization.

Extended Matching Adjustment (EMA)

The extended matching adjustment was introduced in the LTGA exercise to:
- **Extend the application of the matching** adjustment by relaxing the conditions while taking into account an **application ratio** (**AR**)
- The AR results from a **stress scenario** representing the **deteriorated liquidity position** from liability CF uncertainty

10. See https://eiopa.europa.eu/Publications/QIS/CEIOPS-Calibration-paper-Solvency-II.pdf#search=filename%3Aceiops-calibration-paper-solvency-ii%2Epdf, pp. 55-57.
11. E.g., above graph indicates an increase in SCR for a 2 year holding period. This peak should possibly be disregarded: it seems to result from a data artefact as it took approximately 2 years to recover from the effect of the 2001 and 2008 financial crises.

The application ratio shall ensure that insurance undertakings incur no losses due to mismatching and forced sales of assets with a probability of 99.5% over the period till run-off of the obligations.

$$Application\ ratio = \max\left(0{,}1 - \frac{discounted\ CF\ shorfall\ (BE + stress)}{best\ estimate}\right)$$

where:

– Discounted CF shortfall reflects the mismatch under the central scenario plus under a stressed scenario caused by the incidence of lapse risk, mortality risk, disability-morbidity risk and/or life catastrophe risk and their correlation in line with the standard formula.
– Best estimate is the best-estimate liability in respect of the portfolio of matched obligations, calculated using the basic risk-free rate only.

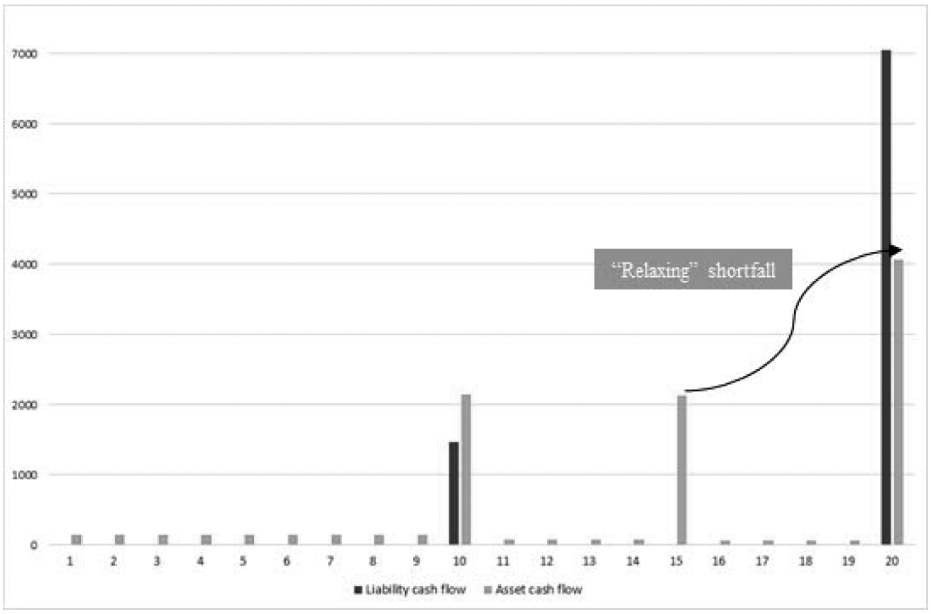
Parameter shocks	Standard I (99.5% VaR)
Lapse	40% shock on the amount of policies or a 50% shock on the on-going lapse rate
Mortality	15% increase in mortality rates
Disability	First 12 months: 35% shock on disability rates Subsequent months: 25% shock disability rates and 20% decrease in the recovery rates
Life CAT	+0.15% in first 12 months on mortality rates

Simplified example – EMA

The following simplified example is considered at EOY17:

– 2 pension savings contracts maturing in 10 years (€ 1500) and 20 years (€ 7500) respectively
– Investment strategy:
  • 20% equity held already for 4 years, resulting in a 5-year holding period
  • 40% in govies maturing in 20 years, 20% in corporates financial maturing in 15 years, 20% in corporates non-financial maturing in 15 years

The duration of the assets is 14 years whereas the duration of the liabilities is 18 years. The CF profile and MA calculation are summarized below:



MA Calculation	
Full MA	40bp
"Relaxed" AR	77%
Final MA	**30bp**

We relax here the shortfall condition in the sense that the bond maturing in 15 years is considered as "held to maturity" and will be used to cover the liability maturing in 20 years. Otherwise, the Application Ratio would be 50% resulting in a MA of 20 bp, which is still significantly higher than the VA of 4 bp EOY17.

We refer to the appendix for a full illustration based on the same simplified example showing the combined impact of the SCR LT Equity and EMA measures on the Solvency II ratio.

Conclusion

Several measures can be considered to reduce any Solvency II excessive volatility on long-term business and we have limited ourselves here to the VA, MA and SCR LT Equity. We note that a reduction of the risk margin[12] would also be favorable to long-term business and thus to long-term investments.

The MA has a significant impact but is not widely used given its very strict conditions. We have studied whether the Extended Matching Adjustment allowing for some CF uncertainty via an Application Ratio would not be a good alternative for relatively predictable but not perfectly replicated insurance products.

We have introduced the concept of Own VA calibrated on an insurer's assets and liabilities as part of its risk management under pillar II to address the basis risk of the VA calibrated at EU level. This fosters a proper integration of all three pillars of the Solvency II framework and further contributes to stability.

Finally, we have studied the risk of equity as a function of the holding period, which appears to be decreasing thanks to dividends capitalization.

In our challenging environment of geopolitical uncertainty, climate change and societal pressure, insurers are key partners to contribute in the long term to financial stability by providing insurance coverage and investing in the real EU economy. In the context of the LTG review, a strong collaboration between the different stakeholders is needed to create an appropriate framework with the same level of policyholders' protection while allowing insurers to meet those multiple objectives.

Glossary of acronyms

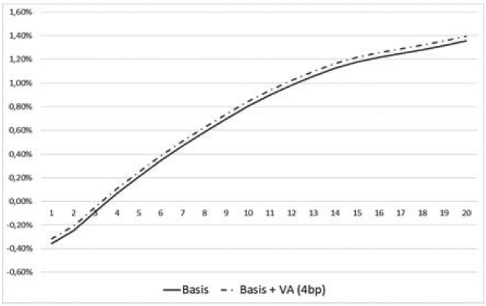
Acronym	Definition
CoD	Cost of Downgrade
dur L	Duration of Liabilities
EMA	Extended Matching Adjustment
ICS	International Capital Standard developed by the International Association of Insurance Supervisors
LS	Liquidity Spread
LTA	Long Term Average spread
LTG(A)	Long Term Guarantee (Assessment). The LTGA assessed in 2013 a set of potential measures for long-term guarantees products under volatile market situations. This resulted among others in the VA concept.
LTG review and measures on equity risk	The review is expected by 2021. The Long Term Guarantee measures include extrapolation of the risk free rates, Matching Adjustment, Volatility Adjustment, extension of the recovery period in case of SCR breach, transitional measure on risk free rates or technical provisions. Equity risk measures include the symmetric adjustment and duration based equity submodule.
MA	Matching Adjustment
MV	Market Value
PD	Probability of Default
RC	Risk Correction
RM	The risk margin represents the costs of transferring insurance obligations to a third party: it is based on an insurer's SCR for unhedgeable risks over the run-off of the contracts multiplied by the cost of capital at 6% and discounted at current risk-free rates. The Market Value of insurance liabilities is then the Best Estimate plus RM.
SCR Review	Review of the standard formula with a focus on reducing complexity, enhancing proportionality and, removing unjustified constraints to financing (2018)
SCR LT Equity	Reduced capital charge for Equity held over a long period
VA	Volatility Adjustment

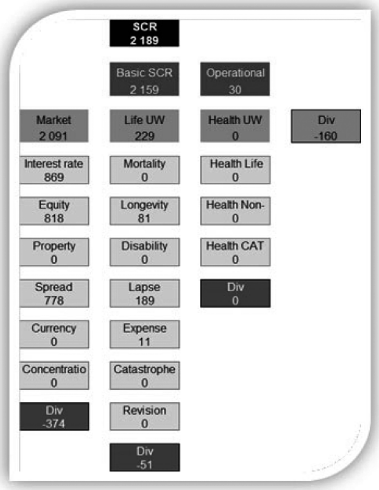
12. The high fixed cost-of-capital of 6% in a low interest rate environment not taking into account the nature of the business has been subject to intense discussions. Next to the cost-of-capital, the methodology will also be part of the LTG review. The high sensitivity of the RM to interest rate movements and significant proportion for long-term business have been major concerns.

Appendix – Simplified example

Basis situation

Assets		Liabilities	
Equities	2 000	OF	3 180
Government Bonds	4 000	RM	125
Corporate Bonds	4 000	BEL	6 695
Total	10 000	Total	10 000





$$SII\ ratio = \frac{3180}{2189} = 145\%$$

The VA EOY17 amounts to 4 bp only. Discounting the future liability CF with above curve results in a Best Estime of € 6695. The Risk Margin amounts to € 125. The own funds of € 3180 are obtained by difference between the market value of assets of € 10000 and the Best Estime plus Risk Margin.

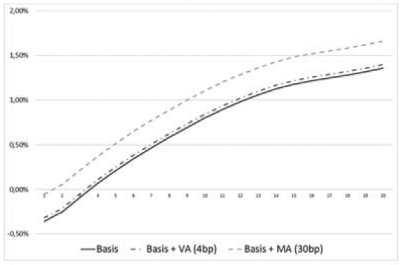
The Solvency Capital Requirement is mainly composed of market risk for € 2091 (interest rate given the duration gap, equity and spread). Life underwriting risk is limited to € 229 and consists mainly of mass lapse and longevity. Comparing the own funds of € 3180 with the aggregated SCR of € 2189 results in a SII ratio of 145%.

After LT business correction

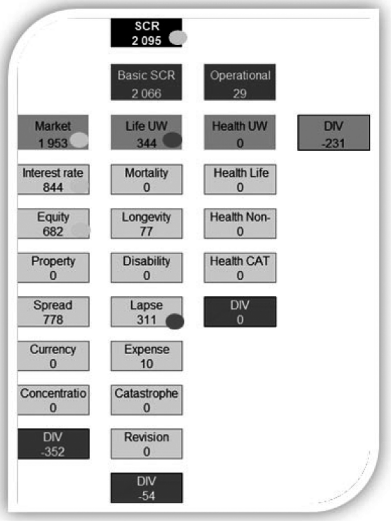
We consider the following adjustments:

– MA: 30 bp, which is significantly higher than the VA of 4 bp
– SCR Equity: 34% given the 5 year holding period, which is much lower than 40.90%[13]

Assets		Liabilities	
Equities	2 000	OF	3 484
Government Bonds	4 000	RM	127
Corporate Bonds	4 000	BEL	6 389
Total	10 000	Total	10 000



Legend:
Positive impact on SCR ratio
Negative impact on SCR ratio



$$SII\ ratio = \frac{3484}{2095} = 166\%$$

13. 39%+1.90% of symmetric adjustment EOY17.

The MA results in a higher discount curve and thus a lower Best Estimate (6389 versus € 6695). The risk margin increases slighlty given the increase in mass lapse due to the increase in interest rate (the policyholder option to stop the contract has more value given the higher delta between the discounting curve and the guaranteed rate). The own funds increases from € 3180 to € 3484.

SCR decreases from € 2189 to € 2095, mainly due to a lower SCR interest following the application of the MA and a reduced SCR Equity given the 5 year holding period. We have not considered any SCR spread reduction due to the MA in this example.

Comparing the own funds with the SCR leads to a SII ratio of 166%, *i.e.* 21 percentage points higher than under the basis situation.

Preliminary findings

This simplified example shows the significant impact of those adjustments that are justified given the long term nature of the considered contracts.

Ideally, we should have tested the same example at another reporting date (*e.g.* EOY18) to evidence the higher resilience of the SII ratio with LT measures to changes in financial conditions.

However, we can already infer theoretically the following:
- The presence of the EMA will dampen the effect of risk-free interest rate movements across periods both for Best Estimate calculations and SCR interest;
- The reduced SCR Equity will lower the impact of change in equity market values;
- An eventual spread reduction under the EMA could be considered

This will result in a global much stable SCR market over time, which is a key component of the SCR.

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