

CEA Working Paper on the risk measures VaR and TailVaR

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Introduction

The industry has strongly supported a risk based economic approach as a basis for the Solvency II framework. Under this framework the Solvency Capital Requirement ("SCR") is expected to be calibrated to a 1 in 200 probability of ruin (assuming a VaR measure) over one year and based on a comprehensive analysis of risks taking into account both risk mitigation and diversification.

There has been discussion from certain stakeholders on the relative merits of VaR as the risk measure to be applied in the framework. In particular, TailVaR has been suggested as an alternative risk measure for the overall framework.

The definition of VaR and TailVaR are provided in Appendix A. The purpose of this document is to highlight certain key points that must be considered as part of the discussion and to explain why the industry is in favour of the VaR approach set out in the Framework for Consultation provided by the Commission.

It should be noted that the comments in this document should be considered in the context of the other publications by the CEA as listed in Appendix B. Together, these documents constitute a coherent package. As such, the rejection of certain elements of our positions is likely to affect the remainder of our comments.

In addition, these are the CEA's views at the current stage of the project. As our work develops, these views may evolve depending in particular, on other elements of the framework which are not yet fixed.

1 Key messages to be taken into account

- 1.1 This document discusses the issues related to using VaR and TailVaR as risk measures within the solvency assessment of insurance companies for the calibration of the Solvency Capital Requirement.
- 1.2 The use of VaR as opposed to TailVar has the following advantages:
 - VaR has become the generally accepted risk measure for financial risk management. It is consistent with the way that many insurance and other financial institutions currently measure and manage their risk.
 - Conceptually VaR is simpler and easier to communicate to third parties. This makes it more likely that it will be embedded in the business by general management. The TailVaR measure is conceptually more complex and requires a greater statistical knowledge to be understood.
 - TailVaR is more difficult to calculate since information on the full distribution of outcomes is required. Details of the distributions of the tail are usually not available and often require additional subjective assumptions. This adds to the overall complexity of the resulting framework without necessarily making the system more robust.
- 1.3 Finally, although this document highlights below a number of practical advantages of using the VaR measure, we recognise that certain companies may prefer to use alternative risk measures, such as TailVaR, if these were thought to be more suitable to their business. It is important that Solvency II does not prevent companies from adopting the approach they think is best to manage their business.
- 1.4 Hence, the adoption of VaR should not preclude the use of TailVaR for internal models if ***this is chosen by companies/groups and acceptable to the supervisor***. However companies would need to demonstrate that the calibration approach used was equivalent to that of the regulatory minimum. The difference in calibration between VaR and TailVaR is discussed further below.

This approach would have the additional advantage of reducing burden for companies already using the TailVaR measure.

2 Elaboration of key messages

There are tangible practical advantages of the VaR measure

- 2.1 Conceptually VaR is easier to explain and communicate within the company. This is an important aspect as one of the objectives of Solvency II is to encourage companies to improve risk measurement and risk management throughout the business. A better understanding of the underlying Risk Management principles increases the real embedding into day-to-day management processes both at the operational level and the Executive Board level.
- 2.2 For companies VaR is easier to calculate as TailVaR requires information on the tail of the distribution. Details of the distributions of the tail are not normally available and often require additional subjective assumptions. This adds to the overall complexity of the resulting framework without necessarily making the system more robust.
- 2.3 TailVaR is not compatible with the use of scenarios within the Standard Approach. A scenario represents a sample from a distribution of possible outcomes so it is possible to select a scenario at the 99.5th percentile for a particular distribution. Therefore, using the VaR measure, it is possible to define the shock or scenario with the required confidence level.

In order to perform a TailVaR analysis, one would require scenarios to describe every position in the tail. This is not practical and could significantly increase the burden on companies with potentially limited additional value added.

- 2.4 Finally, there are significant precedents to the use of VaR in both companies' existing risk management processes and existing supervisory frameworks. This is discussed further in the following section.

There are viable precedents for the use of VaR by companies and supervisors

- 2.5 The following are some of the precedents for using VaR as the basis for a risk based economic approach:

CRO Forum: The work done by the CRO Forum in its paper "Principles for Regulatory Admissibility of Internal Models" indicates that the CRO Forum also support a VaR approach calibrated to an annualised 99.5% probability of solvency. The CRO Forum document also indicates that alternative risk measures are permissible (e.g. TailVaR) provided the calibration approach used can be shown to be consistent with that of a 0.5% probability of economic insolvency.

Society of Actuaries: The Society of Actuaries (SOA) did a survey in 2002¹ on the common practices related to economic capital in insurance worldwide. The survey showed that around 77% of all respondents used a VaR approach as the risk measure based on a given quantile or multiple of the standard deviation, whereas only 15% were using a TailVaR.

Other industry stakeholders: Industry stakeholders have developed a number of models for the design and structure of the Standard Approach. These include the GDV model, FFSA model and the European Standard Approach (ESA). These models have all been based on a VaR approach.

Insurance Regulatory Precedents: In certain jurisdictions, European regulators have supplemented the existing Solvency I regulation with additional requirements. In the case of the UK ICAS regime and Swedish Traffic Light system, these requirements have been calibrated based on a VaR approach.

Banking Supervision: The Basel Committee's recommendation for VaR in 1996 (Basel Committee on Banking Supervision, 1996) and the Basel II norms (Basel Committee on Banking Supervision, 2003) have heightened the importance of VaR as a market risk measure. Following the guidelines of the Basel Committee, financial

¹ Society of Actuaries (SOA) survey 2002 on risk measures used in the insurance industry

regulators all over the world have adopted VaR for designing capital adequacy standard for banks and financial institutions. Correspondingly, many financial firms have adopted VaR for internal risk management and allocation of resources.²

- 2.6 Despite its global acceptance, VaR has been criticised on certain theoretical grounds. In particular, that it is not sub-additive in general and is therefore not a “coherent” risk measure. It is probably for this reason that the TailVaR risk measure was adopted in the Swiss Solvency Test (SST). However, there is research showing that VaR is sub-additive in the tail regions of heavy tailed distributions such as those for asset returns.³
- 2.7 It is worth pointing out that the International Actuarial Association (“IAA”)⁴ solvency working party appears to favour TailVaR as a suitable risk measure in insurance. This is again, most likely due to its theoretical appeal and its focus on tail events.

In its paper the IAA working party also outlines a possible method to applying TailVaR. The paper highlights that this does, however, require further assumptions as to the underlying distribution. This is significantly more complex than the corresponding VaR calculations (which do not require the estimation of the expected value of the tail) and it is not clear that this is viable in the context of a Standard Approach.

VaR at the 99.5th percentile is not the same as TailVaR at the 99.5th percentile

- 2.8 It is important to note that although both VaR and TailVaR are potential risk measures, a 99.5% confidence level under VaR ***is not the same as*** a 99.5% confidence level under TailVaR.
- 2.9 In order to illustrate this point we have provided the following table which shows the calibrations required in order to generate equivalent levels of capital under both risk measures. The results are based on the Normal distribution but the relationship between VaR and TailVaR will depend on the underlying distribution and parameter setting for the various risks. The differences can become more pronounced in case of more ‘skewed’ distributions which are more typical in insurance.

PERCENTILES GIVING RISE TO EQUIVALENT CAPITAL AMOUNTS FOR THE NORMAL DISTRIBUTION

From VaR	To TailVaR	From TailVaR	To VaR
99.0%	97.2%	99.0%	99.62%
99.5%	98.7%	99.5%	99.81%
99.9%	99.7%	99.9%	99.96%

- 2.10 The above Table shows that if TailVar were to be used as the risk measure, then a different calibration would be required in order to generate equivalent capital requirements. For example, under the Normal distribution, TailVaR at the 99.5th percentile would be equivalent to the VAR at 99.8% (or a 1 in 500 probability of ruin over 1 year).
- 2.11 The difference in the calibration was recognised in paragraph 1.9 of the CEIOPS QIS 2 specification: *“The ‘target’ standard is TailVaR at an equivalent level of prudence to VaR 99.5%. A broad assumption has been made that TailVaR 99% would meet this objective, and this is reflected in certain SCR parameters.”*

² Sub-additivity re-examined: the case for Value-at-Risk, Jon Danielsson, Bjorn N. Jorgensen, Mandira Sarma, Casper G. de Vries (dated: February 28, 2005)

³ Sub-additivity re-examined: the case for Value-at-Risk, Jon Danielsson, Bjorn N. Jorgensen, Mandira Sarma, Casper G. de Vries (dated: February 28, 2005)

⁴ IAA Insurance Solvency working party (2004), A Global Framework for Insurance Solvency Assessment

- 2.12 In light of this, care is required to ensure that the calibration used is consistent with the original objective stated in the Framework for Consultation. It would not be acceptable for a change in the risk measure implicitly to change the intended calibration and so raise the target capital requirements for companies. This would act as a barrier to entry into the insurance industry with consequences for both policyholders (increased costs) and markets (reduced competition).

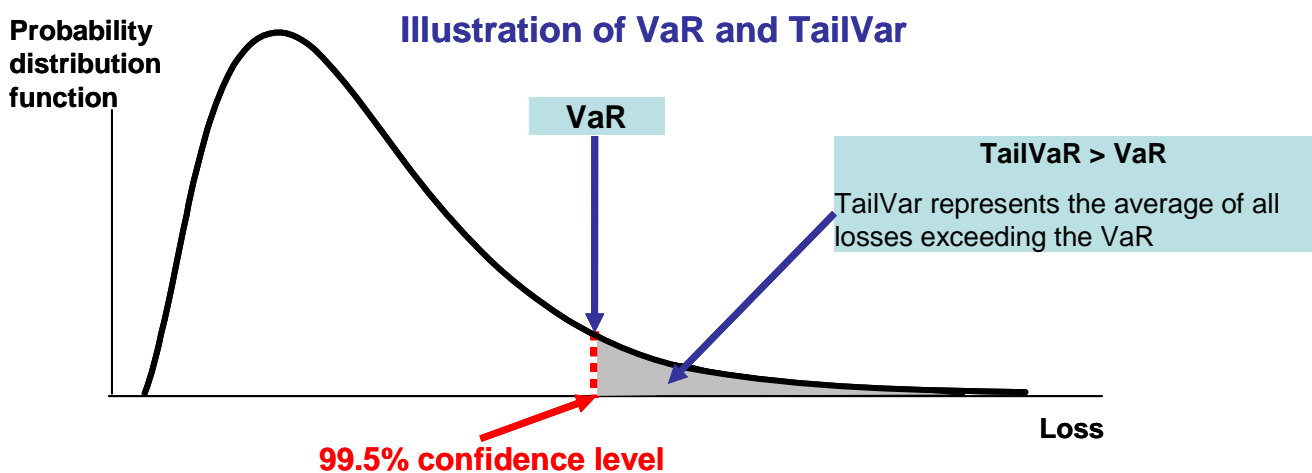
Appendix A: Definition of VaR and TailVaR

Below we define both the Value-at-Risk and Tail Value-at-Risk:

- **Value-at-Risk (VaR)** is the loss at a predefined confidence level (e.g. 99.5%). Thus if the company holds a capital of VaR, it will remain solvent (in the sense of having assets at least as great as its regulatory liabilities) with probability of the confidence level (e.g. 99.5%) and be insolvent with probability of one minus the confidence level (e.g. 0.5%).
- **Tail Value-at-Risk (TailVaR)** is the expected value of the loss in those cases where it exceeds the predefined confidence level. It is sometimes also called Conditional Tail Expectation (CTE), Expected Shortfall (ES) or Expected Tail Loss. Thus the TailVaR is equal to the average loss a company will suffer in case of (extreme) situations where losses exceed the predefined confidence level (of 99.5%).

Another way to explain VaR and TailVaR, is by looking at for example 10000 (simulated) losses. VaR would be set equal to the 50th largest loss (assuming a confidence level of 99.5%). TailVaR would be calculated as the average of the 50 largest losses.

The figure below shows an example of how the VaR and the TailVaR are derived from a loss probability distribution function. The VaR is calculated as the loss by a predefined quantile on the loss distribution function. In this example the VaR is at the 99.5% quantile. The TailVaR is defined as the expected value of all losses exceeding the 99.5% quantile. The TailVaR is by definition always greater or equal to the VaR (for the same confidence level).



Appendix B

It is important to note that the comments in this document should be considered in the context of other publications by the CEA. These can be found under the Solvency II section of the CEA website (www.cea.assur.org) and include:

- Solvency II: Structural Issues (1 March 2005)
- Solvency II - Building Blocks for the Solvency II Project CEA Working Document in Progress (18 May 2005)
- CEA's comments on the CEIOPS' Draft Answers to the 'Second Wave' of Calls for Advice (30 September 2005)
- CEA's comments on the CEIOPS' Draft Answers to the 'Third Wave' of Calls for Advice (9 Feb 2006)
- Solutions to Major Issues for Solvency II – Joint submission by the CRO Forum and the CEA (17 February 2006)
- CEA working document on the standard approach for calculating the solvency capital requirement (22 March 2006)
- CEA document on Cost of Capital (21 April 2006)
- CEA guidance on Quantitative Impact Study 2 (15 May 2006)
- CEA's Pillar II Principles and Comments on Consultation Paper no. 13 (15 September 2006)
- Feedback on CEIOPS Consultation Paper 14 – Joint submission by the CRO Forum and CEA (22 September 2006)
- Assessing the Impact of Solvency II on the Average Level of Capital (16 October 2006)
- CEA Preliminary Feedback from QIS2 (16 October 2006)
- CEA Working Paper on the MCR and Proposed Ladder of Intervention (16 October 2006)

These documents together constitute a coherent package.

About CEA

CEA is the European insurance and reinsurance federation. CEA's 33 national member associations represent more than 5,000 insurance and reinsurance companies. Insurance makes a major contribution to Europe's economic growth and development. European insurers generate premium income of €970bn, employ over one million people and invest more than €6,300bn in the economy.

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