

Risk Management and Solvency – Mathematical Methods in Theory and Practice

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The actual discussions of appropriate risk measures used for the calculation of capital requirements in the Solvency II process have concentrated mainly on *Value-at-Risk* (VaR) and *Expected Shortfall* (ES). However, only recently the possible influence of dependence structures between the various types of risk or lines of business on such risk measures has drawn more attention (see e.g. WÜTHRICH (2003) or EMBRECHTS, HÖING AND PUCETTI (2005)). The dependences between risks play an essential role in Solvency II, since their negligence can lead to a substantial misestimation of the solvency capital. This is particularly critical when looking at natural catastrophes as, e.g., storm, hail, flood and earthquake, where dependences can occur due to close regional distances or climatic triggers. Further, the influence of independent, non-normal risks on the **Solvency Capital Requirement** (SCR) is shown on the basis of the German standard formula (square root formula). Also, when looking at the risk measures Value at Risk and Expected Shortfall it becomes apparent how strong the influence of the underlying dependence structure is, even in the case of uncorrelated risks. We give several examples of uncorrelated (but dependent) risks with the same marginals, which show a completely different behavior for the aggregated risk distribution, in particular for the corresponding VaR and ES . On the basis of these considerations, an approach which essentially consists in an approximation of the underlying copula by certain grid type copulas is introduced, for which the distribution of the sum of more than three risks can be calculated explicitly.

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