Hartmut Kömme
Dipl. Economics, joined SAS as a consultant in 1999. Since 2003 Kömme has been working as a business expert at SAS, specialising in risk. Before joining SAS Kömme worked for several years as a freelance IT specialist. At SAS he has been working extensively on major projects with many international banks and insurance companies.

The challenge of Solvency II

By Hartmut Kömme, SAS Germany

The need for a new solvency system

If in the past, many insurance companies were frequently experiencing difficulties and disruption, these could all too often be traced back to failings in risk management. It should be pointed out that traditional methods and systems for conducting risk management had failed, or could no longer meet modern-day demands for efficient risk management. Solvency II means that an up-to-date initiative is available, which will better control the solvency of insurers and protect insured parties against capital loss. The problem: solvency regulations in force up to now, which focus exclusively on balance sheet codes, are not really risk sensitive. In future, however, thanks to Solvency II, more effective and more meaningful methods of managing solvency should come into use. An example of one such procedure, which insurance companies often use already to determine the financial capital required, is Value Based Management.

From the perspective of financial supervision too, there is a need to use Solvency II to set up a new solvency system. This should avoid regulatory arbitrage between banks, which under Basel II are subject to new risk management obligations, and in the future, insurance companies. There is also a fundamental need for a pan-European levelling out of account tendering requirements for insurance companies. These requirements vary greatly in the different member states of the European Union (EU) and are therefore difficult to compare. For these reasons, it is the aim of the EU Solvency II project to establish a solvency system which takes better account of an insurer's actual risks. The main requirements of the system are that it should not contain too many regulations and should be clear, able to reflect current market developments and be based on general account tendering principles.

The status of Solvency II discussions

Unlike Basel II, which goes back to an initiative of the international union of central banks, Solvency II is being driven forward and developed by a political body – the EU. This developmental process was divided into two phases by the EU Commission responsible. Phase 1 (2001 to mid 2003) marked the discussion and consultation process, in the course of which the general framework of a future solvency system was established. In Phase II (from the end of 2003), methods and approaches are being developed, the planning outcomes are being brought together in a binding consultation paper and concrete practical tests are being carried out in companies. It is intended that consultation should finish at the end of 2007, so that the transfer of Solvency II to individual EU member states can start from January 2008.
A clear obligation of Solvency II is to learn from Basel II and avoid complications from the start. Compared to Basel II, which is very detailed and correspondingly complex, Solvency II is founded first and foremost on principle-based rules, whereby national peculiarities are taken into account and rules should only be laid down at the highest level. The current Solvency II discussion is being driven forward in the EU through CEIOPS (Committee of European Insurance and Occupational Pensions Supervisors). Like Basel II, Solvency II consists, roughly speaking, of a three-pillar structure (see EU Paper Market/2509/03). Figure 1 shows the individual pillars, whose development is the object of the on-going Solvency II work.

Figure 1:

Minimum requirements

The first pillar describes the quantitive requirements with regard to technical insurance reserves and obligations relating, for example, to risk measurement and the provision of personal capital. Solvency capital should be orientated towards the actual total risk and should essentially correspond to the economic risk capital. In this a distinction is made between minimum capital and target capital. In order to determine minimum capital a standard model is prescribed by the EU, which is based on balance-sheet values and simple calculations. Falling below this reference value would result in immediate intervention by the supervisory authorities. The minimum capital forms the lower limit for the target capital. Measuring the target capital should take account of the risk involved. For this the use of complex methods, such as internal risk models and Asset-Liability-Management (ALM), are required and enforced by the insurance supervisory body.

Supervisory Inspection

The second pillar shows principles for internal control and qualitative management of events, including risk modelling. The so-called Sharma Report provides the essential direction here. This study, presented in December 2002 to the European insurance supervisory body investigated, amongst other things, how different combinations of assumed risks and market situations affect the financial stability of insurance companies and how potentially dangerous situations can be recognised at an early stage. The aim is to identify critical situations at an early stage and take countermeasures to prevent serious difficulties. In this context, for a comprehensive picture of the risk situation of an insurance company, it is particularly important to show the overall influences which extend from the underlying event, right through to the effect on the financial result.

After Solvency II comes into force, part of the risk check carried out by the supervisory body will include, for example, stress-tests and crisis scenarios, to test whether guarantee pledges with life assurance companies should be kept, or whether sufficient reserves and reinsurance protection exists with the risk management. The different risks to which the company is exposed must be transparent. Here internal or operational risks will also be taken into account – for example, the efficiency and security of its own IT infrastructure.

The procedures used for risk assessment must be adequately documented by the insurers. These documents serve for regular controls, when checks will be made that the procedures used are adequate and the underlying quantitive figures sizes correct.

Duty to disclose

A key aim of Solvency II is to strengthen market mechanisms through transparency and disclosure. The extent of the publication duties expressed under pillar 3 depends on the procedures chosen for risk measurement. In addition, disclosure duties are co-determined in the sphere of international account tendering, through the work of the International Accounting Standard Board (IASB). What is not yet clear is whether certain supervisory body information should not be made public at first, in order to prevent competitive disadvantage – for example resulting from a non-conforming risk structure leaking out.

Challenges in risk management

New obligations?

Only those insurance companies whose capital is managed efficiently in the context of risk and profit will be able permanently to meet the demands of customers and capital providers. To this extent, the forthcoming requirements of Solvency II do not actually represent new territory, but are an integral part of every company's planning. On the other hand, what is new for a large number of companies is looking at the risks their business is exposed to as a whole. It is necessary to integrate the different sections of the company, in particular the information systems relating to business management and technical insurance, and make them compatible with each other. Today this cannot be done by hand or by means of Excel spreadsheets. The sets of data to be integrated are too large and too diverse and the data analyses to be carried out too complex. Here, data management and data analysis systems can help, which are precisely geared towards the demands of insurance companies and particularly towards risk management in accordance with Solvency II.

Today, risk management must achieve more than simply producing some monthly reports and comments in the appendix to the balance sheet. Rather, what is required is the control of all relevant influence values and the possibility, "at any time", at the press of a button, of being able to get a statement of the company's current risk position. In order to achieve this, insurance companies are required to use integrated and largely automated IT processes, which bring together the necessary data and analyse it in real time. In this, the quality of internal risk models depends, to a large degree, on the quality of the underlying data. Modern risk management is, therefore, first and foremost, good data management. It is the availability and quality of information that decides whether risk management is successful or not. (see also SAS Journal of Risk Intelligence No 1, P16 ff).

Data management

The establishment of internal risk models requires that a multitude of information from different IT systems distributed throughout the entire company is brought together. In the field of capital investment, for example, data about the current portfolio of finance titles and the market data relevant to the assessment (interest graphs, exchange rates, volatilities) are needed. The portfolio data can be extracted from the different operational (business) systems, whilst market data on the other hand usually come from external providers (e.g. Reuters or Bloomberg). Most internal models uses historical timelines of market and damage data. As the basis for the analyses, it is advisable to transfer the required heterogeneous data into a uniform system, into a so-called data warehouse. Here, the data is adjusted and integrated so that originally incompatible information from different systems can be compared and analysed as a whole. In deciding on such a data warehouse solution, the following aspects should be taken into account:

- Are there interfaces to the required delivery systems?
- Are functions sufficient for data transformation?
- Are there functions for checking data quality?
- Performance and scalability with large quantities of data
- Are processes shown and documented transparently?

Ideally, there is an overall data warehouse for the whole company, which integrates all the relevant information from all the company's IT systems and which serves as a uniform and reliable source for the different analytical tasks – for example for risk analysis. This ensures, for example, that the same source data that is used for balance sheet reporting are also taken into account for risk codes – an extremely important aspect for validity, transparency and acceptance of the analysis and reporting results. Today most insurance companies have such data warehouse systems at their disposal, which can be used for formulating risk management solutions. If this is not the case so-called data marts can be set up – these are small data warehouses for specific, clearly delimited tasks.

Internal risk models

With Solvency II, there is an increased need for advanced risk management systems, such as that offered by SAS. The practical functions covered by such solutions include capital management and capital allocations (for example at the level of a section), analysis of profitability, setting rates and optimization of portfolios. They form the basis of stress tests and scenario-based analyses and can help in determining company ratings by external agencies. In order to develop their risk models,

insurance companies can, to a certain extent, fall back on models that have proved successful in banking practice. This is the case particularly in the field of capital investments, but appropriate models can also be derived for the damage and life assurance sectors. For quantifying financial risks with statistical procedures Value at Risk (VaR) is the most used system. The VaR system measures the loss of a financial portfolio over a certain period of time, which with a certain probability can occur to a maximum.

Methods for measuring risk

The VaR can be determined in two different ways, either analytically or by means of simulation techniques. For analytical calculation, the so-called Delta-Normal-Estimate is available, which assumes that the risk factors (external market data which influences the financial value of the portfolio) have a standard distribution. The risk-diversifying effect of risk factors that are strongly correlated in different ways is included in the calculations, via the covariance matrix. The advantage of this method is that the time spent on the calculation is small so that results are rapidly available. The disadvantage is the underlying distribution assumption: the risk cannot be shown correctly in the case of non-linear products, such as an options portfolio.

With VaR determination using simulation procedures, there can be differenciated between historical and Monte-Carlo simulation. Historical simulation is based on past data and manages without distribution assumptions. It is very successful for retrospective analyses based on reliable data. However, it becomes difficult if, for example, a title is newly issued or newly included in a portfolio – and therefore no sufficiently long timelines are available for it. At the level of data management, past data can in this case sometimes be deduced using extrapolation methods or by using reference rates. The length of the underlying timeline can also affect the result, particularly if there were breaks in the trend.

With Monte-Carlo Simulations, the future development of risk factors is predicted by means of a random number generator. At the same time, a multitude of market scenarios can be simulated for the necessary market observations. The portfolio values calculated in this way then reveal the distribution of future profit and loss. A big advantage of Monte-Carlo-Simulation is that it also enables simulations that take account of correlations between several risk factors. In addition, the covariance matrix can be used. When using risk factor models the interdependencies between the individual risk factors can be demonstrated by means of multivaried distribution functions (copulas).

All in all, Monte-Carlo Simulation has a clear advantage for risk calculations in companies compared with other methods: it is the most precise and offers the greatest possible flexibility when integrating very different factors.

In particular, the possibility of correctly valuing products dependent on a path, and the possibility of specifying individual risk factors with special models, is of particular interest for its use in the field of insurance. A frequently mentioned criticism is high computer expenditure. However, this objection is no longer valid with increased efficiency in IT.

Modelling risk factors

Modelling risk factors is the central and most important task in risk management. The relevant factors should be identified and combined in such a way that the model can precisely predict future environmental conditions. For this stochastic models such as Mean-Reversion and GARCH come into play or empirical distribution functions, e.g. Pareto-, Log-Normal and Weibull-distribution. The parameters of the models are either determined by experts according to values based on experience or derived from historical data, by so-called “fitting”.

Damage Simulation Example

Where technical insurance risks are taken on, it is of vital importance that an insurance company can estimate exactly the costs resulting from covering damage. For this insurers need to understand and to calculate the connections between the damage development, the parameters responsible for damage and their chronological dependence. For this, models based on historical data are developed, i.e. models derived from past insurance cases, which are used to calculate the risks. In the search for distribution models insurance experts will find risk management software helpful: it recognises connections between complex records that would be beyond human comprehension and helps the workers involved, through multiple analyses and graphic representations, to get a feel for how the damage originated. If a model appears to be suitable, the model parameters can be estimated with the historical data (“fitting”). Quality measures and graphic comparisons (see figure 2) also support the experts in deciding for or against a model.

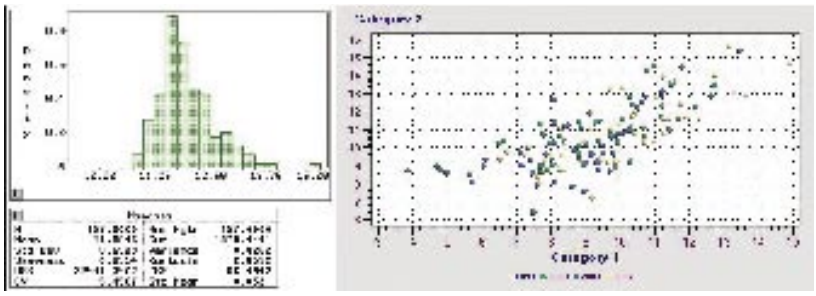

Figure 2: Data analysis example

In order to carry out company-wide risk analysis, the insurers must, in the first instance, determine independently from each other their different lines, e.g. accident, legal protection, car and house contents insurance. This is necessary since each product must follow different stochastic models and, from a technical point of view, must be considered as an individual factor and depicted with its own model. The individual, independent models should be simulated in such a way that in a next step all the correlation effects can also be depicted. Here multi-varied distribution functions can be used, with which the individual damage distributions are linked in such a way that dependencies that exist between them are taken into account. In this way, risk connections that are general to particular areas, e.g. storm damage, can be simulated more precisely.

Integration into a total system
In order to consider the risks of an insurance company in their entirety, the different sections of risk measurement must in the end be brought together in an overall system. Figure 3 shows how, by means of different SAS software, building blocks for such a system can be constructed. First of all, the necessary data must be read from the different source systems. Here it is a case of damage or market data, histories, contract data and master data, with which the individual businesses are described. In this SAS Access interfaces are useful for reading data from very different source systems. By means of data transformation, a data model is produced, on which the risk analyses can be based. SAS ETL Studio provides support in constructing and documenting the data processes.

For the simulation engine (Risk Dimensions), the risk factor models and relevant valuation functions should be used. Here no explicit differentiation is

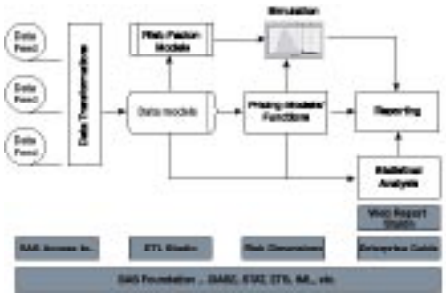

Figure 3: Technology Framework for Solvency II using SAS

made between the capital investment side (Assets) and the damage side (Liabilities). The software can deal with both areas separately or together in the simulation or scenario calculations. The results of the risk calculations are then available for reporting purposes and can, for example, be made available via a web portal to all authorized information users. For statistical evaluations and for producing ad-hoc reports, SAS analysis tools are also available, e.g. the Enterprise Guide.

Conclusion

With Solvency II, greater demands are made on insurance companies vis a vis risk management. Increased expenditure on systems, processes and personnel represents a challenge for small and medium sized enterprises in particular. But those who are ready to actively drive forward this topic today, have a good chance of fulfilling the demands of Solvency II in the future, and of strengthening their market position through good risk management. Waiting for regulations to come into force, and hoping that there will be suitable solutions on the market in the meantime, can result in high expenditure and the opportunity for self-development is wasted.. Instead, it is important to start collecting the necessary data today and use it to gain information.

Appropriate risk management solutions for insurance companies are already on the market – for example as components of SAS Insurance Intelligence Solutions. Simulation and prognostic technologies provide support during the introduction of new products and with the company's fundamental organisation. Solvency II finally gives priority to the core competence of insurance companies in this respect: recognizing, calculating and managing risks. To this extent Solvency II serves not only to protect insured parties, but also helps the companies, who, through better knowledge of their own risks, are able to make better decisions and thereby increase their profitability.