Researchers in Financial Mathematics Calculate Smart Solvency Capital

Insurance companies must regularly present the so-called solvency ratio to the public. This is intended to provide indications of how crisis-proof the providers are. The calculation is very complex and specific, and many companies only perform it once a year. Financial mathematicians are helping to calculate the solvency ratio using artificial intelligence (AI). What this means is explained in an interview with Dr. Stefan Mai, business unit developer "Retirement Provision" in the "Financial Mathematics" department:

Solvency ratio: greater transparency, but also increased complexity. AI provides a remedy.

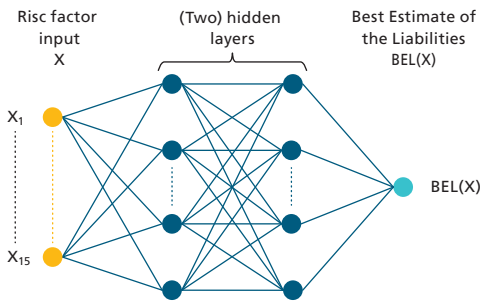
First of all, we should clarify the current meaning of the solvency ratio for insurance companies and how it is dealt with.

The new European supervisory regime Solvency II has been in force since January 2016 – with the aim of avoiding insolvency of insurance companies or ensuring that companies can fulfill their commitments even under extreme circumstances such as crises. Solvency capital is calculated in different ways, with the calculating company having to take into account all risk scenarios relevant to it in each case. Examples of major crises can be natural catastrophes, stock crashes or a strong demand for health insurance services due to epidemics/pandemics. The solvency ratio is a point of reference for the precautions taken by the insurance company.

What support can our expertise provide?

The Solvency II calculations in the area of life insurance are not only required by law, but are also extremely time-consuming, as every single contract is calculated in at least 10,000 future capital market scenarios until expiry. Because of the effort involved - many insurance companies manage millions of contracts in their portfolios - calculations are usually performed only once a year.

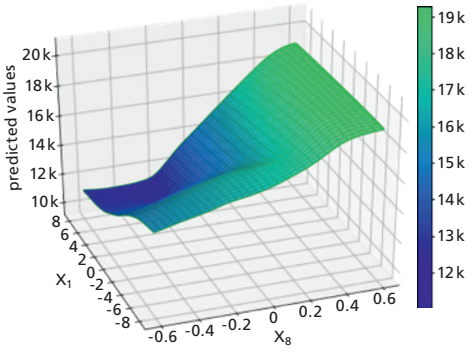
From our discussions with insurance companies, we know that the decision-makers would like to use a neural network that enables a sensitivity analysis of the solvency capital in "real time". Our research concept: The neural network is trained on existing data and the company's internal model. Here, the award-winning ITWM software tool NASE can also be used to determine the optimal architecture of the network. With my colleague Dr. Roman Horsky, I am constantly in discussion about the contribution that quantum computing could make in the context of such a research project, but this is a dream of the future. In any case, as a result, decision-makers should receive information not just once a year, but in "real time" for more precise control - for example, to optimize the return on investment for customers.



Schematic neural network for calculating the available capital
(© https://doi.org/10.3390/risks8040116)

What does that mean in practical collaboration? How can I imagine this?

The starting point are discussions in the form of an intensive workshop to understand the parameters, models and variables on the asset and liability side of the insurance. Subsequently, the data basis is jointly reviewed and the processing effort of the preparation is estimated. Only then do we move on to the actual development and evaluation. Here, we are supported in particular by Dr. Stefanie Grimm as an expert in data science. Finally, the software is jointly integrated into the company system. In all process steps, we proceed according to the principles of agile collaboration. This means that we work flexibly with customers to address changed or additional issues. Collaboration can take place in a joint innovation lab. Here, employees of our department cooperate with employees of the company in a team. Regular consultations ensure a direct flow of information and thus lead to the best possible project result.



Behavior of a neural network with Variation of the risk factors X1 and X8. (© https://doi.org/10.3390/risks8040116)

In such an industrial project, we can leverage our unique selling proposition in the market, an exclusive combination of domain knowledge in financial and actuarial mathematics, combined with methodological expertise in data science and quantum computing.

More information is available on our website
www.itwm.fraunhofer.de/retirement

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