SOE 2: Financial Markets and Risk Management I

Time: Monday 10:00–10:45 Location: H37

SOE 2.1 Mon 10:00 H37

A stochastic method for risk quantification of technical systems — •Magda Schiegl — University of Applied Sciences, Landshut, Germany

We introduce a new method for the risk quantification of complex technical systems (for instance technical devices, processes) and apply it to an example of medical technology. The Fault Tree Analysis (FTA), a method of the classical engineering risk analysis, is combined with methods of stochastic risk management to calculate the total claim distribution of complex technical systems.

The result of a FTA is a structured tree showing all possible problems of the technical system producing claims (costs). The probabilities of the claim events on every node of the FTA tree are also included. At the end of every single tree branch we are left with quite a specific kind of technical problem. Therefore its cost (claim) distribution can be specified quite easily by an expert. As a next step we use stochastic simulation (Monte Carlo) to aggregate all these specific single claim distributions to the system*s total claim distribution. The aggregation is according to the tree*s structure and probabilistic character. In this way all risk measures being used in modern risk management * as for instance VaR or expected shortfall * are accessible. We demonstrate the new method in applying it to a practical example: The dentist*s chair.

SOE 2.2 Mon 10:15 H37

Systematic analysis of system-caused systemic risk — •Lasse Loepfe[1], Antonio Cabrales[2], and Angel Sanchez[1] — [1]Grupo Interdisciplinar de Sistemas Complejos (GISC), Departamento de Matemáticas, Universidad Carlos III de Madrid, 28911 Leganés, Spain — [2]Department of Economics, Universidad Carlos III de Madrid, Madrid 126, 28903 Getafe, Spain

In response to the 2007-2008 financial crisis the consensus among policymakers increased that a macroprudential approach to regulation and supervision should be adopted. The currently preferred policy option is the regulation of capital requirements, with the main focus on combating procyclicality and on identifying the banks that have a high systemic importance, those that are too 'big to fail'. Here we argue that the concept of systemic risk should not be limited to assessing the relative contribution of individual firms to the total risk, but include the analysis of the system as a whole. In a thorough study going from analytical models to empirical data, we systematically explore the effects of network topology on the overall resistance to external shocks. We show that more connected networks are more robust to small tailed shock distributions but more vulnerable to fat tailed shock distributions. The amount of Tier 1 capital required to reduce risk to a given level therefore greatly depends on the topology of the whole system. Other network properties, such as assortativity or clustering had only a minor influence on shock resistance. Vulnerability decreased with firm size heterogeneity when shocks were random, but increased when they were directed at the largest firms.

SOE 2.3 Mon 10:30 H37

Indications of an upcoming financial breakdown — •Jan Jurczyk[1], Johannes Schneider[2], and Ingo Morgenstern[1] — [1]Faculty of Physics, University of Regensburg, 93040 Regensburg, Germany — [2]Department of Physics, Mathematics, and Computer Science, Johannes Gutenberg University of Mainz, 55099 Mainz, Germany

The financial crisis in 2008 showed the weakness of traditional risk evaluation for private investors. In the beginning of 2008 well known financial newspapers and rating firms underestimated the growing risks within the stock market. Therefore the private investor was made to believe that there is no risk within such a system. But the similarities between the spin glass behaviour of the portfolio selection problem, already shown by Markowitz, reveal that the risk is an important observable for recognizing a financial breakdown.

The physical formulation of the portfolio selection problem makes it easier to unveil the risk for a private investor by introducing a simple indicator, which is derived from the idea that ground states of the optimization problem are very sensitive to changes in the solution space and suggests a phase transition.