SOE 2: Financial Markets and Risk Management I

Time: Monday 9:30–10:45 Location: H 0110

SOE 2.1 Mon 9:30 H 0110

Systemic Risks in Techno-Socio-Economic Systems: Need of a New Science — •Dirk Helbing — ETH Zurich, Clausiusstr. 50, 8092 Zurich

Globalization and technological progress have created strongly connected, complex, and global techno-socio-economic-environmental systems. These systems often show large-scale cascading effects (such as the financial, economic, public spending and political crises, for example) and extreme events. However, such effects are largely neglected by models of risk assessment and risk management, leading to insufficient preparations for cases of crisis. It is argued that we need to develop a new systems science, push complexity science towards practical applications, and develop the data science required for this. Furthermore, I will outline the strategy of the FuturICT flagship project to get towards a more resilient and sustainable world.

SOE 2.2 Mon 10:00 H 0110

A Random Matrix Approach to Credit Risk — Michael C. Münnix, •Rudi Schäfer, and Thomas Guhr — Fakultät für Physik, Universität Duisburg-Essen, Germany

We estimate generic statistical properties of a structural credit risk model by considering an ensemble of correlation matrices. We use Random Matrix Theory to setup this ensemble. We demonstrate analytically that the presence of correlations severely limits the effect of diversification in a credit portfolio if the correlations are not identically zero. The existence of correlations alters the tails of the loss distribution considerably, even if their average is zero. Under the assumption of randomly fluctuating correlations, a lower bound for the estimation of the loss distribution is provided.

SOE 2.3 Mon 10:15 H 0110

A time-homogeneous credit mechanism using money and anti-money — •Andreas Schacker and Dieter Braun — Faculty of Physics, LMU Munich

The appearance of monetary crises throughout human history and their interplay with the real economy have puzzled generations of economists. There are many schools of thought on as to what are the actual causes of such crises and how monetary policy can try to avert them. The growing application of tools from statistical physics promises to provide new insight into monetary and creditary dynamics. In particular, it has been suggested that creation of credit money might itself be a source of financial instability.

We show that bank lending via current creditary mechanisms creates non-local purchasing power transfers adversely affecting non-involved asset holders, which might lead to increasing price levels. Starting from this observation, we construct a bi-currency system of non-bank assets ('money') and bank assets ('anti-money') in which a payment can either be made by passing on money or by receiving anti-money. Motivated by an analogy to physics, we impose the symmetry of time homogeneity on the system. This leads to a constant money supply per market participant and prohibits non-local transfers of purchasing power. The issue of credit crunches commonly associated with a constant money supply is overcome by introducing a novel mechanism of liquidity transfer that relies on a free floating exchange rate between non-bank assets and bank assets.

SOE 2.4 Mon 10:30 H 0110

Comprehensive analysis of market conditions in the foreign exchange market: Fluctuation scaling and variance-covariance matrix — •Aki-Hiro Sato[1] and Janusz Holyst[2] — [1]Graduate School of Informatics, Kyoto University, Yoshida-Honmachi, Sakyo-ku, Kyoto 606-8501, JAPAN — [2]Faculty of Physics and Center of Excellence for Complex Systems Research, Warsaw University of Technology, Koszykowa 75, PL-00-662, Warsaw, POLAND

We investigate quotation and transaction activities in the foreign exchange market for every week during the period of June 2007 to December 2011. A scaling relationship between the mean values of quotations numbers (or transactions numbers) for various currency pairs and the corresponding standard deviations holds for a majority of the weeks. However, the scaling breaks in some time intervals, which is related to the emergence of market shocks. There is a monotonous relationship between values of scaling indices and global averages of currency pair cross-correlations when both quantities are observed for various window lengths Δt.