# SOE 10: Financial Markets and Risk Management II

Time: Tuesday 11:30–12:30 Location: MA 001

SOE 10.1 Tue 11:30 MA 001

**Ising model of financial markets with many assets** — •Alexander Eckrot, Jan Jurczyk, and Ingo Morgenstern — Universität Regensburg, Regensburg, Deutschland

Many models of financial markets exist, but most of them simulate single asset markets. We study a multi asset Ising model of a financial market. This model is able to reproduce the most important stylized facts. Furthermore we find that a separation of news into different channels leads to complex cross-correlations, similar to those found in real markets. We also investigate the impact of different decision functions used by the agents to determine the level of imitation.

SOE 10.2 Tue 11:45 MA 001

**Intrinsic and spurious long-range memory in financial markets and ABMs through the lense of first passage times** — •Aleksejus Kononovicius and Vygintas Gontis — Vilnius University, Institute of Theoretical Physics and Astronomy, Vilnius, Lithuania

We aim to explain the phenomenon of long-range memory in socio-economic systems by proposing a simple agent-based model (ABM). From the simple ABM we derive non-linear stochastic differential equations (NSDEs), which are related to a general class of NSDEs reproducing power-law statistics [1]. We have shown that the model is able to reproduce empirical PDF and PSD of high-frequency absolut return [2]. This model also well captures another set of statistical properties (collectively known as bursting statistics) [3,4], which may put an end to discussion whether long-range memory in financial market is intrinsic or spurious.

[1] A. Kononovicius, V. Gontis, PhysA 391, 1309-1314 (2012). doi: 10.1016/j.physa.2011.08.061.

[2] V. Gontis, A. Kononovicius, PLoS ONE 9, e102201 (2014). doi: 10.1371/journal.pone.0102201.

[3] V. Gontis, A. Kononovicius, S. Reimann, ACS 15, 1250071 (2012). doi: 10.1142/S0219525912500713.

[4] V. Gontis, S. Havlin, A. Kononovicius, B. Podobnik, H. E. Stanley, PhysA 462, 1091-1102 (2016). doi: 10.1016/j.physa.2016.06.143.

SOE 10.3 Tue 12:00 MA 001

**Riskmanagement for electric power supply in times of variable, renewable source of energy** — •Magda Schiegl — University of Applied Sciences Landshut, Am Lurzenhof 1, D- 84036 Landshut, Germany

It is well known that a production increase in fluctuating sources of energy, as for instance photovoltaic (pv) and wind energy, leads to a need of growing surplus power installed in order to meet the demand side. We apply methods of riskmanagement to evaluate the reliability of the German energy supply depending on the relation between the fluctuating, renewable energy and the total energy production. To reach this aim we begin with empirical data analysis: The energy time series of pv and wind production on the one hand and the load time series on the other. We separate the time series into a deterministic and a stochastic part by the help of Fourier analysis. On this basis we develop stochastic models for the three time series and calibrate them on the empirical, German power data. Finally, we calculate quantities known from riskmanagement as for instance the default probability or the expected shortfall for these calibrated models. This enables us to discuss the reliability of the future power supply on the basis of a stochastic model and not only as a scenario analysis of past, empirical data as is known from the literature.

SOE 10.4 Tue 12:15 MA 001

**Estimation of Covariance Matrices using Gaussian Processes** — •Rajbir-Singh Nirwan[1] and Nils Bertschinger[1,2] — [1]Frankfurt Institute for Advanced Studies — [2]Goethe University, Frankfurt am Main

Estimating covariances between financial assets plays an important role in risk management and optimal portfolio allocation. Especially if the number of assets is large compared to the number of observations, the sample estimators of covariance and correlation are very unstable or can even become singular. To cope with this problem, a wide range of estimators, e.g. factor models such as the CAPM or shrinkage estimators, have been developed and employed in portfolio optimization.

Here, we propose a novel covariance estimator based on the Gaussian Process Latent Variable Model (GP-LVM). Our estimator can be considered as a non-linear extension of standard factor models with readily interpretable parameters reminiscent of market betas. Furthermore, our fully Bayesian treatment naturally shrinks the sample covariance matrix (which maximizes the likelihood function) towards a more structured matrix given by the prior and thereby systematically reduces estimation errors.

We evaluated our model on the stocks of S&P500 from 1990 to 2017 and found significant improvements in terms of model fit as well as portfolio performance compared to the current state-of-the-art covariance estimators.