SOE 3: Financial Models and Risk Management I

Time: Monday 11:15–12:15 Location: GÖR 226

SOE 3.1 Mon 11:15 GÖR 226

Complex network-based analysis of nonlinear dependencies in multidimensional financial time series — •Alexander Haluszczynski — Ludwig-Maximilians-Universität, Munich, Germany — risklab GmbH, Munich, Germany

Cross-correlation and mutual information based complex networks of the day-to-day returns of US S&P500 stocks between 1985 and 2015 have been constructed in order to investigate the mutual dependencies of the stocks and their nature. We show that both networks detect qualitative differences especially during (recent) turbulent market periods thus indicating strongly fluctuating interconnections between the stocks of different companies in changing economic environments.

A measure for the strength of nonlinear dependencies has been derived using surrogate data and led to interesting observations during periods of financial market crisis. In contrast to the prevailing view that dependencies reduce mainly to linear correlations during crisis it turned out that (at least in the crisis after 2008) nonlinear effects are significantly increasing.

Finally, we apply a Markowitz mean variance portfolio optimization and integrate the measure of nonlinear dependencies to scale the investment exposure. This leads to significant outperformance as compared to a fully invested portfolio.

SOE 3.2 Mon 11:30 GÖR 226

Can Bank-Specific Variables Predict Contagion Effects? — •Christoph Siebenbrunner[1], Michael Sigmund[2], and Stefan Kerbl[2] — [1]University of Oxford, Institute for New Economic Thinking — [2]Oesterreichische Nationalbank

Assessing the systemic risk a bank poses to the system has become a central part in regulating its capital requirements (e.g. the buffer for global or domestic systemically important banks). As with conventional risk types, systemic risks need to be quantified. Currently global regulators propose a range of bank-specific indicators that measure size and interconnectedness to proxy systemic risk. In this study we gauge the capacity of such indicators to explain contagion losses triggered by realizations of sizeable idiosyncratic shocks. We study contagion impact through different channels, separating these effects into first-round, nth-round, asset fire sale and mark-to-market losses. We evaluate the predictive power of models selected by best-subset selection and Lasso by applying 10-fold panel cross validation. We provide constructive proofs for the existence of clearing payment vectors and associated market equilibria for these contagion channels in a model of interlinked balance sheets. We provide algorithms that converge to the greatest market equilibrium in a finite number of steps. Our empirical results suggest that the Basel III indicator set performs well in comparison to alternative data sets of bank-specific indicators. We also find, however, that the proposed data sets without bank dummies do not perform well in capturing the relevance of the average network position for predicting contagion effects.

SOE 3.3 Mon 11:45 GÖR 226

Microscopic understanding of price cross-responses between stocks — •Shanshan Wang and Thomas Guhr — Fakultät für Physik, Universität Duisburg-Essen, Lotharstraße 1, 47048 Duisburg, Germany

Previous studies have discovered the existence of price cross-responses between stocks in correlated financial markets by empirical analysis. However, the cross-responses are not yet understood on a microscopic level. We therefore construct a price impact model between stocks in a correlated market. For the price change of a given stock induced by the short-run liquidity of this stock itself and by the information about other stocks, we introduce a self- and a cross-impact function of time lags. We then model the average cross-response functions for individual stocks by employing the impact functions of time lags, the impact functions of traded volumes and the trade-sign correlators. We find the self- and cross-impact functions are indispensable to compensate amplification effects which are due to the sign correlators integrated over time. We further quantify and interpret the price impacts of time lags in terms of temporary and permanent components.

SOE 3.4 Mon 12:00 GÖR 226

Improved Variance Reduced Monte-Carlo Simulation of in-the-Money Options — •Armin Müller — FernUniversität in Hagen, Lehrstuhl für angewandte Statistik und Methoden der empirischen Sozialforschung, Germany

Pricing derivatives with Monte-Carlo simulations involves standard errors that typically decrease at a rate proportional to N^(-0.5) where N is the sample size. Several approaches have been discussed to reduce the empirical variance for a given sample size. This talk presents a joint application of the put-call-parity approach and importance sampling to variance reduced option pricing. For this purpose, we examine non-path-dependent and path-dependent options. For European options, we observe dramatic variance reduction of several orders of magnitude, especially for in-the-money options. Also for arithmetic Asian options, we achieve a significant variance reduction.