SOE 2: Financial Markets and Risk Management I

Time: Monday 9:30–10:30 Location: MA 001

SOE 2.1 Mon 9:30 MA 001

Reality-check for Econophysics: Likelihood-based fitting of physics-inspired market models to empirical data — •Nils Bertschinger[1,2], Iurii Mozzhorin[2], and Sitabhra Sinha[3] — [1]Frankfurt Institute for Advanced Studies — [2]Goethe University, Frankfurt am Main — [3]Institute of Mathematical Sciences, Chennai

The statistical description and modeling of volatility plays a prominent role in econometric, risk management and finance. GARCH and stochastic volatility models have been intensively studied and are routinely fitted to market data, albeit providing a phenomenological description only.

In contrast, the field of econophysics explains observed market statistics as emerging from the collective dynamics of many actors following heterogeneous, yet simple, rather mechanistic rules. While such models generate volatility dynamics qualitatively matching several stylized facts and thus illustrate the possible role of different mechanisms, such as chartist trading, herding behavior etc., rigorous and quantitative statistical fits are still mostly lacking.

Here, we show how *Stan*, a modern probabilistic programming language for Bayesian modeling, can be used to fit several models from econophysics. In contrast to the method of moment matching, which currently gains popularity, our fits are purely likelihood based with many advantages, including systematic model comparison and principled generation of model predictions. In particular, we investigate the models by Vikram & Sinha and Franke & Westerhoff, and provide quantitative comparisons with standard econometric models.

SOE 2.2 Mon 9:45 MA 001

Information Transmission Channels of the Foreign Exchange Network — •Alexander Becker, Irena Vodenska, and H Eugene Stanley — Boston University, Boston, USA

The foreign exchange market is a network in which the currencies are the nodes and the exchange rate pairs are the edges. While the underlying macroeconomic fundamentals describe the nodes, trading happens on the edges. In an attempt to understand the dynamics of the foreign exchange market, we need to separate the information contained in the nodes from the information in the links.

We use the symbolic performance, describing the appreciation and depreciation of currencies against all other currencies in the market, in other words, the node state, to evaluate the information that is encoded in the edges of the network. We compare the empirical distribution of a pair of nodes with the distribution that arises from a maximum entropy approach. This allows us to quantify the strength of the co-movement of two currencies with respect to the entire market.

We link our results to trading volume of commodities and goods as well as central bank and other political interventions. Our approach allows us to observe the dramatic impact of the capping of the Swiss franc with respect to the euro as well as an decrease in importance of the US dollar with respect to currencies from emerging markets and South East Asia.

SOE 2.3 Mon 10:00 MA 001

Identifying Market States by Methods of Portfolio Management — •Jan Jurczyk and Alexander Eckrot — Universität Regensburg

The world is still thinking about the financial crisis peaking in September 2008. The triggering event was the bankruptcy of Lehman Brothers. To detect such turmoils, one can investigate the time-dependent behaviour of correlations between assets or indices. These cross-correlations have been connected to the systemic risks within markets by several studies in the aftermath of this crisis. We study the SP 500 and DJIA which cover almost all aspects of the US economy and show that monitoring the investor's behaviour approximated by portfolio management mehtods can be used to quantify times of market transition. A method is shown which identifies financial market states and we present evidence of the sharpe transition of 2008.

SOE 2.4 Mon 10:15 MA 001

Extreme portfolio loss correlations in credit risk — •Andreas Mühlbacher and Thomas Guhr — Universität Duisburg-Essen, Lotharstr. 1, 47048 Duisburg

The stability of the financial system is associated with systemic risk factors such as the concurrent default of numerous small obligors. Hence it is of utmost importance to study the mutual dependence of losses for different creditors in the case of large, overlapping credit portfolios. We analytically calculate the multivariate joint loss distribution of several credit portfolios on a non-stationary market. To take fluctuating asset correlations into account we use an random matrix approach which preserves, as a much appreciated side effect, analytical tractability and drastically reduces the number of parameters. We show that for two disjoint credit portfolios diversification does not work in a correlated market. Additionally we show that significant correlations of the losses emerge not only for large portfolios with thousands of credit contracts but also for small portfolios consisting of a few credit contracts only. Furthermore we include subordination levels, which were established in collateralized debt obligations to protect the more senior tranches from high losses. We analytically corroborate the observation that an extreme loss of the subordinated creditor is likely to also yield a large loss of the senior creditor.