SOE 24: Financial Markets and Risk Management

Time: Friday 10:00–10:45 Location: MA 001

SOE 24.1 Fri 10:00 MA 001

Estimating Stable Fixed Points and Langevin Potentials for Financial Dynamics — •Tobias Wand[1,2], Timo Wiedemann[3], Jan Harren[3], and Oliver Kamps[1] — [1]Center for Nonlinear Science, Universität Münster — [2]Institut für Theoretische Physik, Universität Münster — [3]Finance Center Münster, Universität Münster

The Geometric Brownian Motion (GBM) is a standard model in quantitative finance, but the potential function of its stochastic differential equation (SDE) cannot include stable nonzero prices. Under strong constraints derived from additional data, evidence has been found that additional correction terms in the SDE's drift potential should be taken into consideration [1]. Our work generalises the GBM to an SDE with polynomial drift of order q and shows via model selection that q=2 is most frequently the optimal model to describe the data without requiring any additional constraints [2]. Moreover, Markov chain Monte Carlo ensembles of the accompanying potential functions show a clear and pronounced potential well, indicating the existence of a stable price.

[1] Halperin and Dixon, Physica A: 537, 122187 (2019) [2] Wand et al., arXiv 2309.12082 (2023)

SOE 24.2 Fri 10:15 MA 001

Influence of the real economy on financial systemic risk - linking supply chain contagion with financial networks — •Jan Fialkowski[1,2], Zlata Tabachová[1], Christian Diem[1], András Borsos[1,3], and Stefan Thurner[1,2,4] — [1]Complexity Science Hub, Vienna, Austria — [2]Medical University of Vienna, Vienna, Austria — [3]Central Bank of Hungary, Budapest, Hungary — [4]Santa Fe Institute, Santa Fe, USA

The recent COVID-19 crisis has shown that supply chain disruptions may lead to contagion in the financial system. The notion of financial systemic risk (SR) arises from the interconnectivity of financial institutions, e.g. on the interbank market. A shock to this system can originate from supply chain disruptions and for a coherent picture the notion of financial SR has to be extended by including firms and supply chains. Here we explore the relevance of supply chain contagion on financial SR. We use a unique dataset comprised of firm-level data of the Hungarian economy with time resolved information on its supply chains as well as bank-firm credits as well as the interbank loans. We identify and compare the relevance of the different channels through which financial institutions are exposed and show that taking the supply chain layer into account increases the expected losses of financial institutions from interbank exposure by a factor of 2. This highlights the need for a more integrated SR assessment by linking financial risks with dynamics of the real economy.

SOE 24.3 Fri 10:30 MA 001

Multivariate distributions of correlated returns in non-stationary stock markets — Efstratios Manolakis, •Anton J. Heckens, and Thomas Guhr — Universität Duisburg-Essen, Lotharstr. 1, 47048 Duisburg

Risk assessment for rare events is very important for understanding systemic stability. Since financial markets are highly correlated, it is essential to study multivariate distributions of stocks, i.e. the joint probability density functions. To the best of our knowledge, we are the first to empirically study multivariate distributions for a large number of correlated stocks [1]. To this end, we compare empirical distributions with the results of a random matrix model [2]. First, our model separates different time scales: smaller time intervals, so-called epochs, that are assumed to be stationary and large scales on which the non-stationarity of the market is relevant and strong. Second, our model treats nonstationary fluctuations of measured correlation matrices by averaging over random matrices.

[1] Efstratios Manolakis, Anton J. Heckens and Thomas Guhr, Analysis of Aggregated Return Distributions for Stock Markets. Available at SSRN: https://ssrn.com/abstract=4462276

[2] Thomas Guhr and Andreas Schell 2021 J. Phys. A: Math. Theor. 54 125002