SOE 1: Econophysics

Time: Monday 15:00–16:00 Location: H45

Invited Talk SOE 1.1 Mon 15:00 H45

Interplay between multiscaling and rough volatility — •Tiziana Di Matteo — King's College London, London, UK

The multiscaling behaviour of financial time-series is one of the acknowledged stylized facts in the literature [1]. Its source in financial markets has been long debated [2,3]. In this talk I will discuss the origin of multiscaling in financial time-series, investigate how to best quantify it [4] and I will introduce a new methodology that provides a robust estimation and tests the multi- scaling property in a statistically significant way [5]. I will show results on the application of the Generalized Hurst exponent tool to different financial time-series, and I will show the powerfulness of such tool to detect changes in markets' behaviours, to differentiate markets accordingly to their degree of development, to asses risk and to provide a new tool for forecasting [6]. I will also show results to assess the interplay between price multiscaling and volatility roughness, defined as the (low) Hurst exponent of the volatility process [7] and finally I will discuss some new results on the origin of the multiscaling in rough volatility models [8]. [1] T. Di Matteo, Quantitative Finance 7(1) (2007) 21. [2] J. W Kantelhardt et al., Physica A 316 (2002) 87. [3] J. Barunik et al. Physica A 391 (2012) 4234. [4] R. J. Buonocore et al., Chaos, Solitons and Fractals 88 (2016) 38 and Phys.Rev.E, 95 (4) (2017) 042311. [5] G. Brandi, T. Di Matteo, The Eur. J. of Finance, (2021) DOI: 10.1080/1351847X.2021.1908391. [6] I. P. Antoniades et al., Physica A 565 (2021) 12556. [7] G. Brandi, T. Di Matteo, Int. Rev. Financ. Anal. 84 (2022) 102324. [8] P. Casaburi, G. Brandi, T. Di Matteo, submitted (2024).

SOE 1.2 Mon 15:30 H45

The Mechanism and Impact of Ultra Extreme Fast Events on Stock Markets — •Luca Henrichs, Anton J. Heckens, and Thomas Guhr — Universität Duisburg-Essen, Lotharstr. 1, 47048 Duisburg

Recent years have seen much discussion about the mechanism of Ultra Extreme Fast Events (UEEs), which are rapid and strong price changes. In particular, the influence of algorithmic trading or high-frequency traders (HFTs) was studied [1] [2]. HFTs are computer programs that can react faster to UEEs than humans. However, the rapid trading of HFTs would make it extremely difficult to intervene to stabilize a market. Hence, a deeper understanding of UEEs is called for.

In our study, we compare various characteristics of UEEs for the years 2007, 2008, 2014 and 2021. In comparison to the study [1], we show that various statistical properties of UEEs are robust over the years. The recovery rate after a UEE is of particular interest here and indicates that certain underlying mechanisms changed only very little. In contrast to [1], which says that human traders with large market orders generate UEEs, we concluded that liquidity plays a major role in the emergence of UEEs, independent of HFTs and human traders.

[1] Tobias Braun, Jonas A. Fiegen, Daniel C. Wagner, Sebastian M. Krause, Thomas Guhr. Impact and recovery process of mini flash crashes: An empirical study PLoS ONE 13, e0196920 (2018).

[2] Johnson N, Zhao G, Hunsader E, Qi H, Meng J, et al. Abrupt rise of new machine ecology beyond human response time. Scientific reports. 2013; 3:2627. PMID: 24022120

SOE 1.3 Mon 15:45 H45

A New Traders' Game? — Cedric Schuhmann, •Anton J. Heckens, and Thomas Guhr — Universität Duisburg-Essen, Lotharstr. 1, 47048 Duisburg

Traders on financial markets generate non–Markovian dynamics through their competition with each other. This competition can be interpreted as a game between different types of traders. We study the non–stationarity of this game and show that it has changed significantly since the global crisis of 2008.

To reveal the market mechanism, we analyze self–response functions for individual stocks as well as cross–response functions for pairs of different stocks. While the non–Markovian dynamics in the former is liquidity–driven it is only expectation–driven in the latter which might be interpreted as emergence of correlations. Averages greatly improve the statistics, we work out averaged response functions for different years. We thus considerably extend the analysis of Ref. [1,2] in which only the crisis year 2008 was studied.

[1] S. Wang, R. Schäfer and T. Guhr. Cross–Response in Correlated Financial Markets: Individual Stocks Eur. Phys. J. B 89, 105 (2016).

[2] S. Wang, R. Schäfer and T. Guhr. Average Cross–Responses in Correlated Financial Market Eur. Phys. J. B 89, 207 (2016).