AKSOE 16: Financial Markets and Risk Management III

Time: Thursday 13:30–16:00 Location: EW 203

AKSOE 16.1 Thu 13:30 EW 203

When are Extreme Events the easier to predict, the larger they are? — •S. Hallerberg and H. Kantz — Max-Planck-Institut für Physik komplexer Systeme, Dresden

We investigate the predictability of extreme events in time series. The focus of this work is to understand, under which circumstances large events are easier to predict than smaller events. Therefore we use a simple prediction algorithm based on precursory structures which are identified via conditional probabilities. Using the receiver operator characteristic curve as a measure for the quality of predictions we find that the dependence on the event size is closely linked to the probability distribution function of the underlying stochastic process. We evaluate this dependence on the probability distribution function analytically and numerically.

If we assume that the optimal precursory structures are used to make the predictions, we find that large increments are better predictable if the underlying stochastic process has a Gaussian probability distribution function, whereas larger increments are harder to predict, if the underlying probability distribution function has a power law tail. In the case of an exponential distribution function we find no significant dependence on the event size.

Furthermore we compare these results with predictions of increments in correlated data, i.e. , velocity increments of a free jet flow and wind speed measurements. The numerical results for predictions within free jet data comply well to the previous considerations for stochastical processes.

AKSOE 16.2 Thu 14:00 EW 203

Credit risk — a structural model with jumps and correlations — •Rudi Schäfer[1,2], Markus Sjölin[1], Andreas Sundin[1], Michal Wolanski[1], and Thomas Guhr[2] — [1]Mathematical physics, LTH, Lund university, Sweden — [2]Fachbereich Physik, Universität Duisburg-Essen, Germany

We set up a structural model to study credit risk for a portfolio containing several or many credit contracts. The model is based on a jump–diffusion process for the risk factors, i.e. for the company assets. We also include correlations between the companies. We study a simplified version of our model analytically. Furthermore, we perform extensive numerical simulations for the full model. The observables are the loss distribution of the credit portfolio, its moments and other quantities derived thereof. We compile detailed information about the parameter dependence of these observables. In the course of setting up and analyzing our model, we also give a review of credit risk modeling for a physics audience.

AKSOE 16.3 Thu 14:30 EW 203

Time scales and asynchronism in a simple model of financial markets — •Giancarlo Mosetti[1,2] and Damien Challet[1] — [1]ISI Foundation- Torino, Italy — [2]Fribourg University- Fribourg, Switzerland

Financial markets are very complex system. Time, in its broadest sense, has probably the biggest impact in their complexity. For example, it has been claimed that lack of a clear time scale in market agent's behavior allows many heterogeneous beliefs to flourish and interact in a kind of symbiotic relationship.

In the first part of my talk I will analyse using a simple model of financial markets, the Minority Game [1], the interaction of agents with different time scales. The model displays interesting behavior, with phases in which faster agents (speculators) perform better than slower agents (producers), but also phases in which the opposite is true. Analytical as well as numerical results will be presented [2].

In the second part I will discuss another time related phenomenon in financial markets: the delay between submission and execution times of an order in a market, still in the framework of the Minority Game. We will see how a simple modification of the model gives rise to an interesting dynamics.

Bibliography

[1] D. Challet and Y.-C. Zhang, Emergence of Cooperation and Organization in an evolutionary Game, Physica A 246, (1997)

[2] G. Mosetti, D., Challet, Yi-cheng Zhang, Heterogeneous timescales in Minority Games, Physica A 365, (2005)

AKSOE 16.4 Thu 15:00 EW 203

Multifractality and phase transition within the structure defined by the intertransaction time-intervals — •Andrzej Kasprzak[1], Josep Perelló[2], Jaume Masoliver[2], and Ryszard Kutner[1] — [1]Warsaw University, Faculty of Physics, Hoza 69, Warsaw 00-681, Poland — [2]Universitat de Barcelona, Departament de Fisica Fonamental, Diagonal 647, Barcelona 08028, Spain

We considered the intertransaction time-intervals for some future contracts as a well-suited characteristics of investors activity. We observed that the moments of arbitrary order of the empirical intertransaction time-intervals possess negligible small statistical errors. Hence, we were able to find their multifractal behavior, which was well described within the continuous-time random walk formalism. We found that the spectrum of multifractality has untypical left-sided shape (where left side is closed and right one is open, slowly increasing). The multifractality can be considered here as an intermediate phenomenon between two unifractals observed for very small and asymptotically large orders of the moments. We came to the conclusion that transition between uni- and multifractal can be considered as the phase transition of the third order since discontinuity (of the analog) of the specific heat was observed.

AKSOE 16.5 Thu 15:30 EW 203

Exponential distributions with "fat tails" for sales of goods: correspondence to individual income distributions — •Romanovsky Michael — A.M.Prokhorov General Physics Institute of RAS. Russia, 119991 Moscow, Vavilov str. 38

Distribution of new car prices in the USA and UK in 2004 is investigated. In the USA, sales of cars lower than 100000 USD are distributed exponentially with the normalization ~ 21000 USD. The distribution of car sales with prices larger than 100000 USD is the Pareto distribution. In the UK in 2004, sales of cars with prices lower than 50000 pounds are exponential also with the normalization ~ 10000 pounds.

The distributions of individual incomes in the USA, UK, and Australia have the same form: an exponential "body" and Pareto "tail" [1]. The price distribution can be used for the independent evaluation of individual income distribution.

Distributions of new cars sales prices were determined for Russia in 2003-2006. They have the same form as in the USA: an exponential body (before 50000 USD) with the normalization 9000 USD in 2004, and the Pareto tail with the exponent ~ 2 after 50000 USD. The mean estimated individual income in Russia in 2004 was 12000 USD. This income is more than two times larger than the official salary in Russia during this period.

The method can be used for income determination (or reliable estimation) in economics with the partially transparent tax systems.

[1] V.M.Yakovenko et.al. Physica A. 2001. V.299. P.213; Physica A. 2006. V.370. P.54.