

## SOE 4: Financial Risk

Time: Monday 12:00–12:30

Location: H11

SOE 4.1 Mon 12:00 H11

**From many-body physics to financial markets: sparse modeling for inverse problems** — •DANIEL GUTERDING — Fachbereich Mathematik, Naturwissenschaften und Datenverarbeitung, Technische Hochschule Mittelhessen, Wilhelm-Leuschner-Straße 13, 61169 Friedberg, Germany

The accurate valuation of plain-vanilla derivatives is one of the fundamental tasks of mathematical finance. In particular, arbitrage-free interpolations of market-quoted option prices or implied volatilities are needed for the pricing of most options. For this purpose, various standard interpolation techniques have been modified to accommodate the no-arbitrage conditions required by quantitative finance.

Despite this problem being so important for option pricing, the available approaches are quite involved and largely not stable against the noisy inputs that are often encountered in practical applications. Making use of recent progress on inverse problems in many-body physics [1], our method [2] is based on the relation between the terminal density of the underlying asset and plain-vanilla option prices.

We construct a few-parameter model for this relation using the singular value decomposition, which obviates the need to explicitly choose expansion or regression basis functions, such as they are encountered in many other methods. Furthermore, we show that our method by construction delivers arbitrage-free models even for inputs containing noise or severe arbitrage.

[1] Otsuki et al., J. Phys. Soc. Japan 89, 012001 (2020)

[2] Guterding, arXiv:2205.10865

SOE 4.2 Mon 12:15 H11

**An ABM Marketmodel Study: Dynamics, Stochastics and Rule based Decisions** — •MAGDA SCHIEGL — University of Applied Sciences Landshut, Am Lurzenhof 1, D-84036 Landshut

Riskmanagement is a main topic in insurance business with a variety of traditional methods. In recent years more and more methods of the field of complex systems as complex networks or ABMs play an important role. One of the first in the insurance mathematical literature published ABMs is by Ingram et al. [1]. The paper describes a model of a competitive (insurance and not only insurance) market that shows cyclical behavior.

We reformulate the above cited model in a form that makes it accessible for analytical as well as numerical treatment and discussion. We find three, interacting components of the model: the dynamics, the stochastics and the rule based decisions. The agents, insurance companies, play a rule based strategic game, competing with each other. The actions of the agents depend on both, the statistics of the single agent and the statistics of the market as a whole. We analyze the dynamics of the model being responsible for a parameter dependent, periodic behavior and investigate its stochastic and rule-based components. We implemented the model as a Monte Carlo simulation and examine the interactions of the model's different components.

[1] Ingram, D., Tayler, P., Thompson, M. (2012) Invited Discussion Paper: Surprise, Surprise From Neoclassical Economics To E-Life. ASTIN Bulletin 42(2): 389-411