

AGPhil 4: Reduction and Emergence in Econophysics (joint session AGPhil/SOE)

Time: Thursday 15:00–18:00

Location: H 2033

Invited Talk AGPhil 4.1 Thu 15:00 H 2033
Reduction, emergence and mechanisms in magnets and markets — ●MEINARD KUHLMANN — University of Mainz

Treatments of critical phenomena in physics but even more so in interdisciplinary applications exhibit a certain tension when we ask whether a micro reduction is possible: On the one hand, hardly anyone will doubt that these phenomena rest on (or “supervene” upon) the behaviour of the constituents parts. On the other hand, the universality of critical phenomena suggests that the dynamics is in some sense independent from its physical manifestation on the micro level. That is, critical phenomena seem to be “emergent” and thus defy reduction. I will argue that one can dissolve this tension by introducing the notion of “structural mechanisms”. Explanations in terms of structural mechanisms are reductive in the sense that it is the interactive organisation of the micro constituents that matters. However, only certain structural features of the interaction are important whereas the nature of the micro constituents is otherwise irrelevant.

Invited Talk AGPhil 4.2 Thu 15:45 H 2033
Ising models of financial markets? Are we serious? — ●STEFAN BORNHOLDT — Institut für Theoretische Physik, Universität Bremen

Within one or two decades, a subdiscipline of socio- and econophysics emerged that uses the scientific approach of physics to explore the dynamics of markets and human society in a quantitative way. This subdiscipline is also present at the current DPG meeting: the division of physics of socio-economic systems, SOE. A wide range of physics methods from statistical physics and stochastic processes to agentbased (spin) models are applied to financial and behavioral themes. But how can we expect that a complex system as, for example, a stock market, embedded in the world’s economy, could possibly be described by the simplest toy models? Universality, best known from statistical physics of matter, inspires a possible route to a new kind of reductionism: Instead of modeling an economy by the famous representative agent, as done for decades, falsely assuming statistical independence of agents,

today’s agent based models keep agents and their interactions in order to study the emergent dynamics of their collective dynamics. I will give a brief overview of current models and their limits.

Invited Talk AGPhil 4.3 Thu 16:30 H 2033
Emergent phenomena in physics and econophysics — ●RADIN DARDASHTI — IZWT, Wuppertal, Germany

Various kinds of phenomena and properties in physics are regarded as emergent in some sense or another. The temperature of a system, critical exponents or the Hawking effect are all discussed in this context. However, there can be significant differences in their realizations and theoretical treatment, with important consequences for their interpretation. In the econophysical literature the stylized facts of economics are also understood as emerging out of the complex system. But how should we understand the emergence of stylized facts and what does this mean for the treatment of these models?

I will discuss examples of emergent phenomena from fundamental physics and embed it into a general framework, which allows us to shed light on these questions.

Invited Talk AGPhil 4.4 Thu 17:15 H 2033
Stock market crashes as critical phenomena? Explanation, idealization, and universality in econophysics — ●PATRICIA PALACIOS — Munich Center for Mathematical Philosophy, Munich, Germany

We study the Johansen-Ledoit-Sornette (JLS) model of financial market crashes (Johansen, Ledoit, and Sornette 2000) that treats market crashes as critical phase transitions.

On our view, the JLS model is a curious case from the perspective of the recent philosophy of science literature, as it is naturally construed as a ‘minimal model’ in the sense of Batterman and Rice (Batterman and Rice 2014) that nonetheless provides a reductive explanation and causal explanation of market crashes, in the sense of Woodward’s interventionist account of causation (Woodward 2003).