

AKSOE 13: Economic Models and Evolutionary Game Theory II

Time: Thursday 11:45–12:45

Location: H8

AKSOE 13.1 Thu 11:45 H8

Finite-size fluctuations and macroscopic equations in agent-based models: Mutations and extended number of strategies— ARNE TRAUlsen¹, •JENS CHRISTIAN CLAUSSEN², and CHRISTOPH HAUERT¹ — ¹Program for Evolutionary Dynamics, Harvard — ²Institut f. Theoret. Physik & Astrophys., Univ. Kiel, Germany

Agent-based behavioral models of social or economic behaviour are widely investigated by Monte Carlo simulations as well as by differential equations. However, macroscopic stochastic equations can in quite general cases be derived from microscopic behavioral processes [1]. We point out three aspects: First, finite-size fluctuations in coevolutionary dynamics in general differ from additive white noise [2]. Second, it can be shown that the Moran process and a local update process can be identified as microscopic models leading to the adjusted and standard replicator equations, respectively [3]. As a consequence, the direction of evolutionary drift can reverse due to a finite-size effect [3]. Third, the approach can be extended to many strategies and including mutations [4]. Depending on mutation rate, population size, and location of the equilibrium points, the stationary distributions can be localized at the borders, or exhibit interior peaks. We illustrate some of these scenarios by considering neutral selection, the Prisoner's Dilemma, and the snowdrift game [4].

[1] D.Helbing, Physica A 181,29(1992); 193,241(1993);

196,546(1993) [2] J. C. Claussen & A. Traulsen, Phys. Rev.E 71, 025101 (R) (2005) [3] A. Traulsen, J. C. Claussen, C. Hauert, PRL 95, 238701 (2005) [4] A. Traulsen, J. C. Claussen, C. Hauert, PRE 74, 011901 (2006)

AKSOE 13.2 Thu 12:15 H8

Efficient control in a multi-agent stock market model —•ULRICH CHERDRON¹, ROLF PAWELZIK², ROLAND ROTHENSTEIN³, and KLAUS PAWELZIK¹ — ¹Institut für Theoretische Physik, Universität Bremen, Otto-Hahn Allee 1, D-28334 Bremen. — ²Feldstr. 68, 24105 Kiel. — ³56, Avenue de Cailles, 1170 Bruxelles, Belgium.

Simulations demonstrate that the exchange of stocks and money during trade in an order book market balances external influences on the return which are induced by fundamental traders. Here we present a novel formalization of order book price determination in stock markets from which we derive gradient based learning rules that optimize the dynamic parameters (stocks and money held by each agents) for control. We analyse the dynamics of both the returns and the internal dynamical parameters in a minimal model by comparing on-line versions of these learning rules with the natural adaptation caused by trading. Our results explain the emergence of control by trading which might contribute to the apparent efficiency of real stock markets.