SOE 15: Economic Models and Evolutionary Game Theory I (with BP, DY)

Time: Wednesday 14:00–15:15 Location: GÖR 226

SOE 15.1 Wed 14:00 GÖR 226

When does a professional foul in soccer pay off? — •Metin Tolan — Fakultät Physik, TU Dortmund, metin.tolan@tu-dortmund.de

In soccer, a professional foul is a deliberate act of foul play to prevent an opponent's goal. Such a professional foul is punished by a mandatory red card and the team is thus reduced by one player for the rest of the time. This reduction in the number of players obviously reduces the performance of the team. However, if this reduction happens during the last minute of the game it is almost certain that it pays off since the opponent will not score two goals or more in the remaining time. On the other hand, if the professional foul happens in the first minute then it is likely that the opponent scores more than one goal in the 89 minutes to follow since it is a game 11 vs. 10 for a rather long time. Therefore, there must be a certain minute t_{pf} so that a professional foul pays off for $t > t_{pf}$ and not for $t < t_{pf}$. This minute will be calculated with a simple model based on the scoring rates of professional soccer teams. The result will be discussed and compared with famous actual and past professional fouls.

SOE 15.2 Wed 14:15 GÖR 226

Rating Team Strength in Soccer Leagues by Elo Numbers — •Oliver Rubner and Andreas Heuer — Institute of Physical Chemistry, University of Muenster, Germany

Measuring the relative performance in sports where opponents are playing matches against each other is a diffcult and often unsatisfactory task. This is mainly due to the restricted number of matches played and the influence of chance on the outcome of each match. In many sports there is a system of points which are attributed to the teams according to a won, lost or draw match. From these points a table is constructed that should reflect the relative fitnesses of the teams. These approaches are by no means unique and often simlpy historically motivated. An example where the ranking follows a mathematically elaborate computational scheme is the Elo ranking in chess[1]. The key of this scheme is the computation of a win probability function from the so called Elo number which is changed after every match by taking into account the relative strength of the opponent. In this scheme enter two or three parameters which need to be determined.

We will present an iterative procedure to determine the win probability function for soccer leagues and derive a method to compare different measures of team strength such as Elo numbers, points or goal differences.

[1] Elo, Arpad, The Rating of Chessplayers, Past and Present, Arco Pub. 1978.

SOE 15.3 Wed 14:30 GÖR 226

Soccer between the 1st and the 90th minute: is it a Markov process? — •Andreas Heuer and Oliver Rubner — Institute of Physical Chemistry, University of Muenster

In previous work we have developed a theoretical understanding of the fitness of a team and its influences on the outcome of a specific match [1,2]. Here we analyse whether or not non-Markovian effects are present *within* a single match. Does the future course of a soccer match depend on the present score, on the time when the last goal was scored, on the team which scored the last goal? If all these and similar questions find a negative answer one can indeed speak of a Markovian process. In this case soccer would be very similar to tossing a coin, at least from a statistical point of view.

Studying all matches during the last 20 seasons of the German Bundesliga we find that most but not all questions find a negative answer. A simple psychological explanation is suggested which may account for the observed deviation from Markovian behavior.

[1] A. Heuer, O. Rubner, Eur. Phys. J. B **67**, 445 (2009).

[2] A. Heuer, C. Müller, O. Rubner, Europhys. Lett. **89**, 38007 (2010).

SOE 15.4 Wed 14:45 GÖR 226

The value of information in strategic interaction — •Eckehard Olbrich[1], Nils Bertschinger[1], David Wolpert[2], and Jürgen Jost[1] — [1]Max Planck Institut für Mathematik in den Naturwissenschaften, Leipzig — [2]NASA Ames Research Center

In games against nature information always has a positive value, i.e. knowing more increases the single player's utility. However in situations with more than one strategic player having more information can be disadvantageous to a player, if the other players know about this extra information. Games with a first mover advantage are a simple example. However, Bagwell [1] showed that this effect of extra information on player behavior and payoffs could be destroyed by an infinitesimal amount of observational noise when players are fully rational. We study the effects of information in a more general setting, by using the Quantal Response Equilibria (QRE) as the (bounded rationaity) solution concept. By using the QRE we can exploit tools from information theory to rephrase the problem of the value of information in terms of rate distortion theory. In particular, we can analyze how the position of the QRE's depend on the capacity of the information channels connecting the players and Nature variables, and on the rationalities of the players. We focus on hysteresis effects in this dependence, and its impact on social welfare.

[1] K. Bagwell, Commitment and Observability in Games, Games and Economic Behavior 8, 271-280 (1995) [2] D. H. Wolpert, M. Harre, E. Olbrich, N. Bertschinger, J. Jost, Hysteresis effects of changing parameters of noncooperative games, arXiv:1010.5749v1 [cs.GT]

SOE 15.5 Wed 15:00 GÖR 226

The Overlooked Effect of Stating One's Own Risk Preferences on Subsequent Decision Choices: Evidence of Inherent Indeterminacy of Risk Preferences from a Laboratory Experiment — •Lora Todorova and Bodo Vogt — Otto-von-Guericke Universität Magdeburg, Faculty of Economics and Management, P. O. Box 4120, D-39016 Magdeburg, Deutschland

With the help of a laboratory experiment we try to test the predictions of quantum game theory. We show that answering a questionnaire about one's own risk preferences before playing a 2x2 coordination game changes subjects' strategy choices as compared to the case when the 2x2 coordination game is directly played. We argue that the act of answering the questionnaire alters subjects' risk preferences which further induce a change in their strategic behavior. The mathematical formalism of quantum mechanics is used to explain our findings. It is shown that the quantum game theory framework is a more powerful tool for analyzing strategic behavior than standard economic theories.