

## AGSOE 5: Social Systems, Opinion and Group Dynamics

Time: Monday 16:00–17:45

Location: BAR 205

### AGSOE 5.1 Mon 16:00 BAR 205

**Identification of the different ingredients governing the outcome of a soccer match** — •ANDREAS HEUER, CHRISTIAN MÜLLER, and OLIVER RUBNER — Institut für Physikalische Chemie, WWU Münster

In previous work we have shown that during a *whole season* of the Bundesliga the quality of a team can be characterized by a single fitness value  $F$ . It can be estimated from the league table [1]. Here we analyse the three relevant ingredients, determining the outcome of a *single match* of teams A and B with fitness  $F_A$  and  $F_B$ , respectively.

1.) Which law determines the expectation for the average goal difference  $\Delta G_{AB}$  of this match? From symmetry and self-consistency arguments the most general function  $\Delta G_{AB}(F_A, F_B)$  can be identified. Comparison with the actual data allows one to adjust the parameters and to obtain a *unique* function. 2.) How important are fluctuations of the team fitness from match to match around its average value? Surprisingly, the effect of fitness fluctuations is very small. 3.) Given the average outcome of a match, what is the probability for a specific result? In contrast to a previous interpretation [2] the number of goals per team in a match can be extremely well described by a simple Poisson process (up to 8 goals).

In summary, soccer turns out to be a surprisingly simple match with respect to its statistical properties.

[1] A. Heuer, O. Rubner, Eur. J. Phys. B (in press).

[2] E. Bittner et al, Europhys. Lett. 78, 58002 (2007).

### AGSOE 5.2 Mon 16:30 BAR 205

**Anomaly interactions in network of Polish Football League** — •ANDRZEJ JARYNOWSKI and JANUSZ MISKIEWICZ — Institute of Theoretical Physics, University of Wrocław, pl.M.Borna 9, 50-204 Wrocław, Poland

In recent years prosecution in Poland has been investigating several clubs, referees and players because of corruption procedures. We study the statistical properties of results in Polish League, looking for evidence of non-sport activity. We treat league as a complex system and we use tools from statistical physics to research some of its properties. Our analyse include: (1) comparing spectrum of correlation matrix with one of the \*cleaner\* national leagues-Bundesliga and random matrixes(from different distributions related to this type of data); (2) investigating system of ranked elements in time serie and finding which clubs play for anothers profits; (3) analysing statistical situation before and after matches, which were stated by the court as those in which a crime has been committed; (4) estimating parameters of Kopocinski model to predict propability of appearance of non-sport intervention in investigated match. This research is dedicated to release Polish Football from problem of corruption.

### AGSOE 5.3 Mon 16:45 BAR 205

**Cointegration of output, capital, labor, and energy** — •ROBERT STRESING<sup>1,2</sup> and REINER KÜMMEL<sup>2</sup> — <sup>1</sup>Institute of Physics, University of Oldenburg, Germany — <sup>2</sup>Institute of Theoretical Physics, University of Würzburg, Germany

Standard economic theory assumes that the markets of the production factors capital, labor, and energy operate in an equilibrium state, where the cost share of each production factor is equal to its output elasticity, which reflects its productive power. According to this assumption, the role of energy as a production factor is marginal, be-

cause it only accounts for five per cent of the total factor costs.

We apply cointegration analysis to the linear combinations of the time series of (the logarithms of) output, capital, labor, and energy for Germany, Japan, and the USA since 1960. The computed cointegration vectors represent the output elasticities of the aggregate energy-dependent Cobb-Douglas function. We find that they are for labor much smaller and for energy much larger than the cost shares of these factors. These findings disagree strongly with standard economic theory, but support results obtained with heterodox LINEAR production functions.

Our results elucidate the forces behind the pressure towards increasing automation and unemployment, and question the concept of "neoclassical equilibrium" as well as influential analyses of the economic impacts of climate change based on standard economic theory.

Ref.: R. Stresing, D. Lindenberger, R. Kümmel, "Cointegration of output, capital, labor, and energy", Eur. Phys. J. B 66, 279-287 (2008)

### AGSOE 5.4 Mon 17:15 BAR 205

**A definite analytic relation between the unisex G7 life expectancy and the envelope of their annual output in goods and services** — •HANS G DANIELMEYER and THOMAS MARTINETZ — Institut für Neuro- und Bioinformatik, Universität Lübeck, Ratzeburger Allee 160, Germany

The leading nation's mean unisex life expectancies are compared from 1850 to date with their annual output of goods and services per capita. Wars destroy analytic relations, but life insurers eliminate catastrophic losses, and the outputs have a well defined envelope representing the undisturbed existential condition. Both evolutions are S-functions with the same growth parameter of 62 years. This length bridging 3 generations and its constancy over 6 generations to date suggest epigenetic stabilization. For the first time it is seen that the mean life expectancy precedes the existential condition by constant 59 years and approaches an extrapolated age of 118. This precedence and the ratio 2 follow exactly when life integrates proportionally over existential conditions. There is no adjustable parameter. Individual life and technical progress seem to be guided by a coherent set of relevant knowledge. This supports our previous results that the industrial society's evolutionary pace is determined by our biologic nature as long as there is a sufficient buffer of relevant knowledge.

### AGSOE 5.5 Mon 17:30 BAR 205

**The Academic System and The Marketplace of Ideas** — •SABINE HOSSENFELDER — Perimeter Institute for Theoretical Physics, Waterloo, Canada

The scientific community makes for an interesting case study for the emergence of social phenomena from individual interests. As a community of practice with only peripheral external interactions, researchers in academic institutions form an almost closed system, with overaveragely intelligent agents, whose activities are well documented.

In this talk, I want to examine the incentive structure in the academic system and the macro-trends that follows from the micro-behaviours of researchers. Most importantly, one can identify four pressures that result in the adaptation of strategies suitable to the environment: peer pressure, financial pressure, time pressure, and public pressure. I will further examine the question under which circumstances incentives for simplified secondary criteria can work against the primary goals of the community, and will argue that institutionalizing measures for scientific success hinders the system's performance.