The physics of monetary systems is badly understood in the economics profession and the discipline lacks a scientific basis. In an advanced monetary production economy, all human needs are reduced into the need for money and the monetary quantum drives the dynamic efficiency of economic productivity. In this economic state, the typical working of the monetary body is the interplay of fiat credit from private banks via minimized fractional reserves and the emission of fiat money without the growth of economic productivity via public monetary policy. This banking system is a violation of the physical or natural laws of economic production as the monetary system is a physical process of higher order, i.e., the global financial crisis is the result methodical monetary mischief; some economic alternatives to this systemic error shall be presented.

The EU - project "Solvency II" aims to rule the regulatory capital requirements of all European insurance companies. A so called "Standard Model" has been developed that should calculate the individual, risk adequate capital every company should hold in order to survive a one in two hundred year event. In addition to the model the EU published the calibration methods as well as the calibrated values for the Standard Model’s parameters. We focus in our work on the extreme value calibration of the equity risk. This part of the risk model aims to quantify the risk of equity-portfolio losses for insurance companies in the case of extreme market events. We compare the results of the EU calibration paper with empirical market data analysis and discuss the consequences.

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We study numerically [1] different proximity graphs (Delaunay-Triangulation, Gabriel graph, relative neighborhood graph, minimum-radius graph) that are discussed as "backbones" of ad-hoc communication networks. Ad-hoc networks represent, e.g., collections of radio-devices without fixed infrastructure. Typically, remote devices are seldom linked directly to each other, but connected indirectly via several paths composed of multiple nodes and edges. This motivates the question how structure and information-transmission efficiency of these graphs are affected by a failure of a given fraction of nodes. Therefore, we study and compare the influence of different node-removal strategies by considering systems up to $N = 10^4$ and determine, using finite-size scaling techniques, the fraction of nodes (for each strategy) that yields a breakup of the respective graph in the thermodynamic limit. [1] Hartmann, A. K., Practical guide to computer simulations (World Scientific, 2009)

Our demands on the limited number of companies in the case of extreme market events. We compare the results of the EU calibration paper with empirical market data analysis and discuss the consequences.
The financial crisis in 2008 showed the weakness of traditional risk evaluation for private investors. In the beginning of 2008 well known financial newspapers and rating firms underestimated the growing risks within the stock market. Therefore the private investor was made to believe that there is no risk within such a system. But the similarities between the spin glass behaviour of the portfolio selection problem, already shown by Markowitz, reveal that the risk is an important observable for recognizing a financial breakdown.

The aim of the project is to supplement the knowledge of the spread of sexually transmitted diseases in the first part of the project in Swishd and Polish society through computer simulations with the theoretical discussion about sexual, temporal network (who with whom, when and how often). The model has aggregated the most important paths of infection (the main heterosexual population, sex workers and men who have sex with men) for the most important pathogens. The main goal is the authoritative analysis of the costs and losses of potential epidemiological control strategies and identifies potential problems that health care will have to face in the future. In the second part, the purpose is to understand the structure of the network and the temporal aspects of sexual relationships of humans and the possibility of using this structure in the epidemiological control. Modeling the spread of sexually transmitted diseases in Poland contains: (1) Adjust various parameters of the epidemiology of pathogens based on medical reports from around the world; (2) Simulations of epidemiology of pathogens and associated diseases with control optimization problem in terms of medical and financial metrics. Constructed model describes the spread of pathogens and could indicate an effective tool in the fight against infectious diseases (vaccination, screening of preventing programs). It would helped with verification of hypotheses on empirical analysis.

The social temperature reacts to market imbalances and thus becomes time dependent. The system shows alternating metastable phases: (a) fluctuations around fixed points connected to a non-equilibrium phase transition, as well as: (b) ordered states of low temperature.

Inter-burst times of the empirical high-frequency financial market data and non-linear stochastic models

Recently we have proposed a non-linear stochastic model of return and trading activity in financial markets reproducing power law probability and spectral densities [1]. The reproduced statistical properties are in agreement with the high frequency empirical data. The proposed class of nonlinear stochastic differential equations is also known to exhibit power law bursting behavior [2,3], while similar behavior is also observed in the empirical data of financial markets [3]. In this contribution we will extend our previous approaches to the burst statistics by considerably more detailed analyses of the model and empirical inter-burst time durations.

The impact of attractions on pedestrian flow

Self-organized pattern formation of pedestrian crowds, such as lane formation, turbulent movement, and human trails, has been subject to interest of various disciplines. The microscopic pedestrian flow models have described the pedestrian motions in terms of driving, repulsive, and attractive forces. However, little attention has been paid to attractive interactions between pedestrians and objects including shopping displays and museum exhibits. In reality, such attractive interactions may lead to impulse stop behavior; pedestrian stop walking to destinations and join the attractions for certain amount of time. This study

The impact of attractions on pedestrian flow — JAEYOUNG KWAK1, HANG-HYUN JO2, ISAKKI KOSONEN1, and TAPIO LUTTINEN1 — Department of Civil and Environmental Engineering, Aalto University School of Engineering, Espoo, Finland — Department of Environmental Engineering and Environmental Science, Aalto University School of Science, Espoo, Finland

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investigates the impact of attractive force on pedestrian flow by devising the social force model with attractive forces. Changing attractive force parameters yields radical transition between two distinct aggregate patterns. Relaxed pedestrian flow is observed when attractive interaction is weak. On the other hand, strong attractive interaction reveals clustering around the attractive objects, although pedestrians intended to walk to destinations with their desired speed. The proposed approach provides a useful framework to improve pedestrian facilities in shopping centers and museums.

SOE 25.15 Thu 17:15 Poster C
Fluctuation-dissipation relations in physiological data collected during emotional stimulation — Jan Cholonenewski, Anna Czmiel, and Janusz Holyst — Faculty of Physics, Center of Excellence for Complex Systems Research, Warsaw University of Technology, Poland

We present results of our search for fluctuation-dissipation relations in physiological data (i.e. phasic skin conductance, facial EMG). Data comes from experiments that were performed in the frame of Cyberemotions project [1] and concerned people’s emotions observed during experiencing emotional stimuli (i.e. IAPS images). For the sake of this study, we also tried out several approaches for quantifying re-experiencing emotional stimuli (i.a. IAPS images). For the sake of motions project [1] and concerned people’s emotions observed during emotional stimulation.

SOE 25.16 Thu 17:15 Poster C
Dynamic Nonlinearities in Financial Time Series — Christoph Raeth — Max-Planck-Institut fuer extraterrestrische Physik

The investigation of financial times series by means of nonlinear data analysis is attracting more and more attention in statistical physics. The characteristic fat tails in the probability distribution of the returns are one example of the so-called stylized facts of the fluctuations of price indices. Many of those refer, however, only to the distribution of the returns, where temporal correlations are no longer taken into account.

Here, we present a new method to identify dynamic nonlinearities by analyzing the phase maps of Fourier phases. We find highly significant signatures for nonlinearities in the day-to-day returns of the Dow Jones. We repeat the analysis for rank-ordered remapped Dow Jones data, for which by construction the stylized facts referring to fat tails are vanishing. Also in this case we can identify phase correlations. Comparing the data with respective surrogates, we estimate the significance of the detected new signatures of purely dynamic nonlinearities. We further demonstrate that the phase correlations propagate into the calculation of classical nonlinear statistics, e.g. the nonlinear prediction error [1]. We can thus establish qualitatively new signatures in time series of market indices. Realistic market models should be able to reproduce them in addition to the already well-known stylized fact.


SOE 25.17 Thu 17:15 Poster C

The ongoing economic crisis has drawn special attention to the importance of network stability. Following the work of Buldyrev et al. (Nature 464, 1025*1028, 2010), we examine the behavior of interdependent networks under random failures. Motivated by real-life scenarios, we introduce the possibility of edge re-organization, as a means of enhancing network resilience, to the original model. The interdependence between two networks is known to lead to cascading failures, resulting in a first-order phase transition concerning the size of the mutually connected giant component. In our variant of the model, networks are able to *heal* to a degree that is easily tuned by a model parameter. We investigate the effect of healing on the order of the phase transition as a function of this parameter. We present simulation results for different kinds of network topologies and compare our results with previous findings.

SOE 25.18 Thu 17:15 Poster C
A Big Data approach to the governing rules of "No. 10 Downing Street" — Scott A. Hale, Taha Yasseri, and Helen Z. Margetts — Oxford Internet Institute, University of Oxford, Oxford, UK

Analysing the collectively generated Big Data in cyberspace has significantly enriched our understanding of social phenomena in recent years. In this work, we focus on mobilization activities within the framework of the UK Government website, “No. 10 Downing Street”. We consider a sample of 8,000 petitions and follow their dynamics in a period of two years. We extract the empirical laws governing the growth of the petitions in regard to the number of supporting individuals. We observe the importance of early time evolution of the petitions in determining the overall success of them over long time periods. Moreover, we measure the critical mass needed for a successful percolation of each petition in a giant piece of the society. Our results, not only deepen our knowledge on the mechanisms behind the growth and spread of socio-political ideas and opinions, but also could be considered to develop and enhance infrastructures to facilitate more effective government-society interactions.

SOE 25.19 Thu 17:15 Poster C
University collaboration networks — Julian Siękiewicz, Krzysztof Soja, Janusz Holyst, and Peter Sloot — 1Faculty of Physics, Center of Excellence for Complex Systems Research, Warsaw University of Technology, Poland — 2Computational Science, University of Amsterdam, The Netherlands — 3National Research University of Information Technologies, Mechanics and Optics, Russia — 4Nanyang Technological University, Singapore

We perform the analysis of scientific collaboration at the level of universities. The scope of this study tries two answer two fundamental questions: (i) can one indicate a category (i.e., a scientific discipline) that has the greatest impact on the rank of the university and (ii) do the best universities collaborate with the best ones only? Using two university ranking lists (ARWU and QS) as well as data from the Science Citation Index we show how the number of publications in certain categories correlates with the university rank. Moreover, using complex networks analysis, we give hint that the scientific collaboration is highly embedded in the physical space. We also show that the strength of the ties between universities is proportional to product of their total number of publications.