Book of Abstracts

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welcome

Programme

Thursday, 7 May

OPENNING

JM Rektor UR oraz Przewodniczacy Komitetu Organizacyjnego Sympozjum
Thursday afternoon, 7 May, 13:15

Session 1.1
Thursday afternoon, 7 May, 13:30
Chair: Stanisław Drożdż

13:30	Oral

Fluctuation scaling of quotation activities in the foreign exchange market

Aki-Hiro Sato[1], Maiko Nishimura[1], Janusz A. Holyst[2]

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We study scaling behavior of quotation activities for various currency pairs at foreign exchange market. The components' centrality is estimated from multiple
time series and visualized at a currency pair network. The power-law relationship between a mean of quotation activity and its standard deviation for each currency pair is found. The scaling exponent α and the ratio between common and specific fluctuations η increase with length of the observation time window Δt. The result means that although for $\Delta t = 1$ [min] the market dynamics is governed by internal processes, at longer time scale $\Delta t > 100$ [min] the information flow from outside becomes more important. We point out that quotations activities are not independently Poissonian for $\Delta t = 1$ [min], and temporally or mutually correlated activities of quotations can happen even at this time scale. A stochastic model for the foreign exchange market based on a bipartite graph representation is proposed.

14:15	Oral

Modelling emergence of money

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An Agent-Based Computational model of production, consumption and exchange of goods is studied. The model exhibits the feature of the emergence of money. Its dependence on two independent parameters and different phases of the model behavior are analyzed. Also, it is shown that in the case of emergence of money no single good plays this rule ad infinitum - after sufficient time period this rule is overtaken by another good.

14:45	Oral

Stock Indices for emerging markets.

Krzysztof Karpio[1], Arkadiusz J. Orłowski[1,2]

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Stock market indices are analyzed for some European countries and New York DJIA. The analysis, based on the Hurst exponent and investment horizon approach is performed to find characteristic of emerging markets.

15:15	Oral

The identification and prediction of deterministic chaos in economical time series

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This lecture is devoted to the problems of identification and prediction of deterministic chaos in economical time series. Deterministic chaos is a phenomenon that implies the possibility of short-term prediction, but excludes a long-term prediction. The lecture starts with a presentation of the mathematical tools (elements of the theory of chaotic dynamical systems) used in the research. The main part of the lecture, i.e. the identification of chaos, will be done according to the following steps: reconstruction of phase space, calculating a correlation dimension, calculating largest Lyapunov exponent, R/S analysis and BDS test. The predictions wiil be done using FNN method and radial basis functions. The analysis concerned with the daily log returns of ten stock market indexes and two automatically generated chaotic series (the series of the first coordinates of Henon map, and some logistic map). Also 12 series, obtained by the mixing of the previous series, were considered. The described research, on the one hand has not shown indisputably that chaos occurs in economical time series. On the other hand, it had been shown, that the considered series are essentially different from random series.

COFFEE BREAK
Thursday afternoon, 7 May, 15:45

Session 1.2
Thursday afternoon, 7 May, 16:15
Chair: Zbigniew Suraj

16:15	Oral

The Zaller model of mass opinion with interactions

Krzysztof Kułakowski, Piotr Gronek

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We consider the Zaller model of public opinion, known as the Receipt-Accept-Sample model [1]. Recently the model was reformulated [2] in a 2-dimensional space of political issues, in conceptual accordance with the Deffuant theory [3]. In this formulation, the only parameter was the largest possible ideological distance a, which can be made by a citizen in one mental step. Main result was that citizens with small a are more prone to extremal opinions. In accordance to the initial formulation by Zaller, the model dealt with citizens subjected to a stream of political news, but an interaction between citizens was not taken into account. Here we generalize the model as to include this interaction within a model social network.

[1] J. R. Zaller, The Nature and Origin of Mass Opinion, Cambridge UP, Cambridge 1992.

[2] K. Kułakowski, Physica A 388 (2009) 469.

[3] G. Deffuant, D. Neau, F. Amblard, G. Weisbuch, Adv. Complex Systems 3 (2000) 87.

17:00	Oral

Interpretations of complexity of social systems

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Since the 1970s of the 20th Century attempts have been made to apply in social sciences and economics the ideas stemming from the so-called complex systems studies.

In some applications of models of complex systems in social sciences and economics two weaknesses can be observed. Specialists in social theories tend to apply mathematical complex systems models, analogies and metaphors without a proper delving into their meaning in the original domains. It can be seen when studying some works on complexity, chaos theory and the similar concepts used in economics and various disciplines of social sciences.

On the other hand, mathematicians, physicists, etc., often tend to apply their models to social phenomena without referring to more sophisticated characteristics of social/economic systems. It results in simplifications limiting relevance of such models to social reality, and in some cases it makes them useless from the point of view of social and economic theory and practice.

All those abuses are partly caused by vague definitions of complexity applied in the studies of socio-economic phenomena. In his search for explaining the meaning of complexity Seth Lloyd identified 31 definitions of complexity. Later this number increased to 45. There is not any commonly accepted definition of complexity and such a definition seems neither needed nor achievable but a deeper understanding of the meaning of complexity in the study of society, which can be in some way depicted as "complexity of complexities", is needed.

Two basic meanings of complexity can be distinguished – "hard" (objective) complexity expressed with mathematical models of objects of study independent of observer and "soft" (subjective, constructivist) complexity developed in social sciences, and reflecting the relations between an object of study and the observer.

The aim of the paper is to present a survey of interpretations of complexity applicable in the studies of social systems. The survey includes both "hard" (objective) complexity and "soft" (subjective) complexity.

Conclusions resulting from the paper can be used by social scientists and economists applying ideas drawn from complexity studies as well as by those who apply mathematical models of complexity in studying various phenomena in society, economy and finance.

17:45	Oral

Indifferents as an interface between Contra and Pro

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In most sociophysical simulations on public opinion, only two opinions are allowed: Pro and Contra. However, in all political elections many people do not vote. Here we analyse models of dynamics of public opinion, taking into account Indifferent voters. In particular, we consider the process where Contra are forced to be Indifferent by their Pro neighbors in a random network. The final concentration of Contra is found to decrease exponentially with the initial concentration of Pro. The obtained plot is the same for small-world networks of different topology.

18:15	Oral

Methods for community detection in social networks

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Deeper studies of often subtle and complex properties of various social networks require novel tools and approaches. It is especially true with respect to the so-called community detection problem. It is discussed within a framework of graph theory. We focus our attention on development and applications of genetic algorithms. Results obtained for different fitness functions are given.

Friday, 8 May

Session 2.1
Friday morning, 8 May, 8:30
Chair: Mieczysław Król

8:30	Oral

Economics in a Context of the Fundamental Principles

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Economy can be justifiable discerns as overpowering flows of the abstract ability of doing work called capital in economics and energy in physics. The Sun energies concentrate in human capital via the Earth organic life and processes of photosynthesis. Then through processes of labour the human capital is transferred to products. A level of intense capital is a factor influencing an exchange value of the products. Thanks to constant inflow of the Sun energy the economy is none zero positive game, where the most participants can win. It manifests by an economic constant p = 0.08 [1/year] that expresses natural economic potential of growth. This constant is the indispensable factor changing the initial capital, which is influenced by the three subsequent variables: the constant p, diffusion rate s, and ratio m, representing labour and management. One of the essential tasks of the economics is moderating of these games in order for achieving a state close up to social justice, where the most of the participants are the winners. Considering economy as capital flows one can ask about mandatory fundamental principles for economics. It is noticeable that at least three laws established in physics create scientific framework for economic considerations. The first is a statement that capital does not arise from nothing. The second is that all concentration of the capital spontaneously diffuses, provided the diffusion is not congested by aimed action. The last relates to law of the least action, which points out requirement of optimization. Contemporary economics are different than sciences since some macroeconomic theories admit violation of the fundamental law as the capital conservation. It is a fact when the Central Bank creates paper money known as cash for commercial banks use. In correct way money arises only as equivalent of labour done, as abstract pay receivable and of course payable. Therefore present money creating procedures leads to financial instability.

9:15	Oral

Predicting corporate failure in terms of Polish business enterprises

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The issue of corporate failure in market economy serves as vital and up-to-date theme elaborated in economic literature and market practice [1], [3]. Nowadays, worldwide economic situations prove that all businesses irrespectively of size, turnover or geographical position are endangered of corporate crisis and bankruptcy. Each entrepreneur needs to monitor their company's financial state incessantly as well as their competitors, suppliers and partners. Only sufficient management and controlling may ensure flexible response to market threats [5].

Polish businesses increasingly become inclined to the launch of Early Warning Systems in order to gather information concerning instant corporate financial condition and forecasts for the future. Despite discriminant analysis being widely explored within corporate failure prediction research, the number of modern models for bankruptcy prediction, using artificial intelligence powers, steadely increases [3].

The main objective of the paper is a proposal of a new methodology for corporate distress and failure prediction in terms of selected artificial intelligence methods with special attention paid to rough set theory [2]. Financial condition of 240 cases is described by means of 30 financial ratios. The data comes from financial reports for two years in a row and all bankruptcies occurred within 2 to 5 years since the forecast.

For the research there is Rosetta [4] expert software used, designed to data analysis on the rough set theory basis.

[1] Kuciński, K., Mączyńska, E. (red.), Zagrożenie upadłością. SGH, Warszawa 2005

[2] Pawlak, Z.: Rough Sets - theoretical aspects of reasoning about data. Kluwer

Academic Publishers, Dordrecht 1991.

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[4] ROSETTA homepage (2004). Available: http://rosetta.lcb.uu.se/general/

[5] Zelek A., Zarządzanie kryzysem w przedsiębiorstwie. Perspektywa strategiczna, Orgmasz, Warszawa 2003.

9:40	Oral

Labour demand in Podkarpacki Province:a Tsallis Entropy Econometrics Model

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The paper presents a labour adjustment demand model for the private sector of Podkarpacki province in Poland. The model sets up short run and long run relationships between labour demand determinants through an error self correct process.

Due to the nature of this autoregressive distributed lags model(ADL) and to very short period of the sample, traditional methods of parameter estimation are ineffective. Subsequently, we propose to apply the generalized maximum Tsallis entropy econometric approach –as a generalization of Jaynes-Shannon-Gibbs Information theoretic entropy formalism already applied to classical econometrics(Golan[and oth.],1996)- to estimate the parameters of the model.

Based upon multifractal dimensions,Tsallis non extensive entropy has proved to be useful in the case of high frequency financial market analysis. We then extend the approach to classical econometrics case when small, lower frequency data sample is available. Such a sparse data sample should display too tail queue Gaussian distribution.

Parameters estimation approach is presented and related- inferential information indexes proposed and computed. In particular, we note the value of non extensive parameter q which varies in response to changes induced to the weighting parameter of criterion function of the model.

Tsallis entropy outputs are compared to those of Jaynes-Shannon-Gibbs approach and of classical LS method computations. Despite enough similar results, we conclude that non extensive entropy leads to a better in-sample prediction of the model but seems to be, at least in the present study, as instable as Jaynes-Shanon approach with respect to initial conditions.

On economic side, above results show a slow adjusting mechanism of actual lever of employment to its long run targeted equilibrium owing to expected market perspectives.

10:05	Oral

Deterministic chaos and catastrophes in business cycle theory

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The primary thesis of the paper is that a general systems theory provides a perfect basis for conducting all kinds of comparisons in the theory of business cycles, and it also enables its further development. A cognitive aim was to show that applying the theory of bifurcations and morphogenesis in the domain of economic fluctuations allows constructing models of the cycle with greater explicatory and utility values than there were so far. In this way, the precision and consistency of the theory increases. In this field the great weight have the applications of catastrophe theory. Another fact was indicated that the discovery of deterministic chaos places the issues of explanation and forecasting in economics in a totally different light. The practical objective was to prove that under some circumstances predicting becomes impossible. Every nonlinear chaotic system is characterized by its own predictability horizon which cannot be surpassed. This, in turn, limits the effectiveness of traditional economic policy.

10:30	Oral

Description of Management Science Problems in Physical Sense

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The epistemology of management science is unordered and trials of ordering are usually unsuccessful. One of the problems is rejecting of physical approach to investigation of social phenomena, which allows on reasoning about interactions between micro state and its surroundings, and for statistical averaging of the micro state properties, regardless the detailed research of its. It derives from management archetype related to interaction of peoples onto peoples, whereas a physical description means reification what is not fully accepted by humanistic scientists. But it works successfully in operational research.

From all aspects of the management science it is possible to extract measurable problems related to interactions between the organization and its surroundings, for which physical model of description is acceptable. Management is always related to future events and may be understand as a set of decisions for planned events performing in accordance with a defined objective function (semantic model of interactions). It allows onto measurement of the micro state at different time moments what leads to axiological evaluation of managing. But without acceptance of measurement philosophy similar to natural sciences it is impossible to apply such useful formalisms as metric spaces, game theory, statistical approach, etc.

From the external observer point of view it is not important what changes will take place inside the interacting organization with the surroundings. Important are results of the interactions. For the internal observer not only the external effect may be interesting, but also some changes of resources forming the organization. The resource based view for description of the organization is the best model for formal, physical type descriptions of its interaction with the surroundings, acceptable from both points of view. It allows on creation interesting numerical representations and quantitative models based on analogies to physics.

COFFEE BREAK
Friday morning, 8 May, 10:55

Session 2.2
Friday morning, 8 May, 11:30
Chair: Janusz A. Hołyst

11:30	Oral

News from application of the Mittag-Leffler function to house and financial markets

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We consider current speculative bubbles and crashes on US-house market and different stock markets. We found that both rising and falling paths of local peaks are well described by a generalized exponential function or the Mittag-Leffler (ML) one superposed with various types of oscillations. We found that this function is a solution of the nonhomogeneous fractional relaxation equation applied independently to each path, which defines our Rheological Market Model Dynamics. The model is an analog of the one which de-

scribes nonexponential relaxation of some viscoelastic materials (biopolimers).

12:15	Oral

Dynamics of some Polish internet-based networks

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There exist several Polish internet-based social communities, "Grono" (http://grono.net) being just a good example. Dynamics of a number of new users entering such a society is investigated via various regression models. Trends are estimated and possible interpretations of distributions for the rate of new user increase are provided.

12:45	Oral

Multifractal dynamics of stock markets - study of developing and developed financial stocks.

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We present comparative analysis of multifractal properties for the financial time series built om stock indices of developing (WIG, WIG 20) and developed financial markets (DJIA, S&P 500). It is shown how the multifractal properties change with the change of bessa-hossa trends and between various markets. The influence of positive (negative) returns on the multifractal dynamics of stocks is studied in different time windows - from macroscopic scale (long-lasting trends) up to microscopic scale (daily changes). We also emphesize that one has to adjust properly the scaling range in various markets to keep its multifractal picture. Thus, this scaling range can be an additional measure of multifractal power of the market independently on the width of $f(\alpha)$ spectrum being studied so far.

13:15	Oral

Fractals, log-periodicity and financial crashes

Paweł Oświęcimka[1], Stanisław Drożdż[1,2], Jarosław Kwapień[1], Andrzej Z. Górski[1]

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Financial markets can serve as an example of complex systems with extremely complicated structure. It is not a surprise, thus, that analysis of these systems is a difficult issue, which requires involving of the concepts borrowed both from physics and from mathematics.
Due to the fact that self-similarity is one of the best documented properties of financial data, an approach that seems to be most promising in describing the financial markets is the fractal analysis. Moreover, besides the standard fractal characteristics of data like the mono- and multifractality, the self similar character of financial signals manifests itself also in the existence
of a hierarchy of the log-periodic oscillation patterns preceding and following the financial crashes and the trend reversals.
In our present analysis we consider a few major world stock indices from period 2004-2009. We show that the reversal date of the upward trend in Nov 2007 can be estimated much earlier from the log-periodic oscillations starting in March 2006. We identify the self-similar nature of the accelerating and decelerating log-periodic trends, showing that fully-developed log-periodic
structures at lower levels constitutes in fact the individual oscillations at higher levels. Furthermore, a frequency analysis of the oscillations confirms the hypothesis of the existence of a universal scaling factor λ, responsible for condensing of the oscillations, equal to 2.

13:45	Oral

The influence of time delay in information flow on the economy system evolution.

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The basic task of a company managements is to take decisions. The typical elements of the decision process are the knowledge about the system state and the understanding the laws governing the system. Unfortunately neither the state nor laws are fully known.
We have also to consider the fact that the acquiring information in economic resemble the meteorology problems rather than a typical physical measurement, where we can repeat experiments and obtain the information in real time. In economy the measurements performed on a global scale are first of all expensive, secondary gathering the data and processing it requires some time. Therefore the information about economy systems has two important features:

- at the moment of announcement the information has some time delay and describes the system in some past,
- the measurement is repeated in some intervals, therefore the information about the system should be considered as a discrete set rather than continuous.

The time delay problem was investigated in the case of spacial evolution of the homogeneous and heterogeneous economy systems. In both cases the delay flow influenced significantly the evolution of the system leading to oscillations or instability resulting in crashes of the system. In the case of heterogeneous system was able to survive even in the case of long time delay, because the crashes occurred only locally and the system was able to recover since the abandoned areas were inhabited by neighbouring companies. In this case the time delay leads to oscillation of the company concentration, which can be interpreted as economic cycles.
Besides global economy also the stock market case was considered. Usually the stock market is considered as a system with short or even zero time delay, because the information about the price is known instantaneously. However the market is coupled to an eco-

nomy and these two systems interacts. In the study we consider the influence of the time delay on the system properties.

LUNCH
Friday afternoon, 8 May, 14:15

Session 2.3
Friday afternoon, 8 May, 15:15
Chair: Mesjasz Czesław

15:15	Oral

Statistical and network-based analysis of English and Polish literary texts.

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We analyze the statistical properties of selected English and Polish texts. We investigate the scaling relations of the rank-frequency distributions of words. From this point of view, we compare the corpora consisting of texts written by the same author with the corpora consisting of texts written by different authors as well as the corpora of native texts with the ones of translated texts. Moreover, we transform texts into series of numbers and apply a few standard methods of the time series analysis in order to look for statistical dependencies in texts, among which are the fractal properties. We also construct different network representations of texts and study their topology.

15:40	Oral

The bibliographical database RSDS - ontological approach

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The RSDS system (ang. *Rough Set Database System*) is a bibliographical database concerning the rough sets and their applications. The database contains about 4000 descriptions of publications in the BibTeX format. The RSDS system is available for free at *http://rsds.univ.rzeszow.pl.*

The research conducted with the use of this system is based on compiling methodology and mechanisms which allow to "understand" the meaning of possessed information, i.e. bibliographical descriptions of publications, and on the basis of this information to ag-

grandize and improve the abilities of the system (searching, adding information etc.). The proposed process has been based mainly on ontology used for describing the relations between the concepts appearing in a considered field and bibliographical descriptions of publications. The proposed methodology of the problem described looks as follows:

- Formulating and creating the ontology of a field i.e. the rough sets.
- Formulating and creating the mechanism allowing to generate a "mini" ontology out of possessed information (bibliographical descriptions).
- Comparing the "mini" ontology and the ontology of a field as this will allow to define what a given publication describes, on the basis of understanding the description of a publication.

At present, while conducting the research we have created the ontology of a field and we have also worked on the mechanism of generating "mini" ontologies out of the bibliographical description of a given publication. The next step will be experimental verification of the mechanism of generating "mini" ontologies, which allows for improvement of created mechanism.

References

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Rough Sets VIII, Springer-Verlag, Berlin 2008, 307-331.

16:05	Oral

The Cox's model in the oncology

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We consider the Cox's proportional hazard model describing the phenomena in which the unexpected events (e.g. deaths) exist in the disjoint time intervals. For such a model variation Kalbfleische'a-Prentice'a estimators has been conformed which determine the baseline hazard function and the baseline survivals function. In practice it enables to determine the survival and hazard functions for the researched units varied with the vector of endo- and exogenous features. The discussed functions have been estimated on the medical examples which include the sick from Rzeszow' region suffering from malignant tumours . The influence of demographical, social and economic features on the therapy results have been discussed.

16:30	Oral

SEIRV model: Optimal pattern of vectors' dispersal

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We study properties of SEIRV (Susceptible-Exposed-Infectious- Recovered-Vaccinated) model of the epidemic spread. We assume that the infection spreads locally by interactions with the nearest neighbors. In addition to the local spread of epidemic there is a nonlocal spread produced by vectors.

Traditionally, epidemiological modelling focuses on the construction of the optimal eradication and containment strategies. These strategies should be able to stop or to prevent a potential epidemic outbreak at the lowest cost possible, reducing the number of causalities or wastage. Nevertheless, due to the fact that the exact state of individuals and detailed information about the structure of interaction is not known, optimal strategies, as we have showed previously, are not always the most efficient ones. Furthermore, presence of mobile vectors which can contribute to nonlocal epidemic spreads makes control actions even less efficient.

Here, contrary to traditional epidemiological modelling, we focus on a study of vector properties and the interplay between vector characteristics and their dispersal pattern. More precisely, we study a SEIRV model from a vector perspective asking questions about the shape of an optimal dispersal pattern of vectors. The optimal dispersal pattern is understood as the one which maximizes a given vector's characteristic. As an exemplary measures we use: time for which vectors are in the infectious state, the number of individuals infected by vectors or a total duration of an epidemic.

From detailed numerical simulations we can conclude that different measures are not always equivalent and, consequently, they can lead to different types of the optimal shape of vector dispersal. From the whole class of considered random walks some of them are favored over others. However, the exact shape of the optimal random walk depends on a considered measure. The biggest discrepancies are produced by measures derived from the number of casualties and time.

COFFEE BREAK
Friday afternoon, 8 May, 16:55

Session 2.4
Friday afternoon, 8 May, 17:20
Chair: Ryszard Kutner

17:20	Oral

Nonequilibrium phase transition due to social group isolation

Julian M. Sienkiewicz, Janusz A. Holyst

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We introduce a simple model of a growing system with m competing communities [1]. The model corresponds to the phenomenon of defeats suffered by social groups living in isolation. A nonequilibrium phase transition is observed when at critical time t_c the first isolated cluster occurs. In the one-dimensional system the volume of the new phase, i.e. the number of the isolated individuals, increases with time as $Z \sim t^3$. For a large number of possible communities the critical density of filled space equals to $\rho_c = (m/N)^{1/3}$ where N is the system size. A similar transition is observed for Erdös-Rényi random graphs and Barabási-Albert scale-free networks. Analytic results are in agreement with numerical simulations.

[1] J. Sienkiewicz, J. A. Hołyst, e-print: arXiv:0807.1984v2

17:45	Oral

Rentier strategy of optimal consumption.

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I'm going to study a continuous time stochastic model of optimal consumption plan.

An agent invests his capital W_0 in some financial instrument. The instantaneous rate of return r(t) of this instrument is given by stochastic fractional differential equation. During persistence of the investment our rentier consumes part of his wealth. Therefore the dynamic of wealth process W(t) is described by the following equation

W'(t) = W(t)r(t) – c(t),

where c(t) is a consumption rate process. The point is to choose optimal consumption strategy with respect to power utility function $u(x) = x^a$, $0 < a < 1$.

I'll present in my talk the properties of the solution of the stochastic control problem mentioned above.

18:10	Oral

Invariance of multiattribute utility functions under shift transformations

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This is a joint work with A. Abbas and J. Aczel. Following A. Abbas, we say that a utility function U is invariant under shift transformations provided there exist functions k and l such that U(x+z)=k(z)U(x)+l(z). In our talk we extend the analysis to multiple attributes. In particular, we consider the case where invariance is satisfied by identical values of the shift parameters.

18:35	Oral

Financial markets contagion - the copula based approach.

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Financial contagion is the cross-market transmission of shocks or the general cross-market spillover effects. It can take place both during "good" times and "bad" times. Then, contagion does not need to be related to crises. However, it is emphasized during crisis times.

Understanding and describing contagion are essential for coping with financial crises. In fact, the presence of financial contagion among markets can mitigate the effects of diversification of investments precisely when they are needed most. In our study we follow the so called "spatial" approach introduced by Bradley and Taqqu in 2004. Roughly speaking, there is contagion from market X to market Y if there is more dependence between X and Y when X is doing badly than when X exhibits typical performance, that is, if there is more dependence at the loss distribution of X than at its center. One of the main features of this approach is that it ``does not require any definition of crisis and normal periods and it is not temporal in nature''.

We propose the following definition of contagion (Durante, Jaworski 2009). Let X and Y be the random variables representing returns of two financial markets. Thus, contagion is defined as an increase of the dependence in some tail regions of the joint distribution of (X,Y) with respect to some central regions. Moreover, as just copulas describe the dependence among random variables, contagion refers to the comparison among threshold copulas obtained with respect to tail regions or central regions of the unit square.

As an empirical illustration of the above methodology we consider two markets:

the New York Stock Exchange (US) and SWX Swiss Exchange AG in Zurich (Switzerland). We compare the daily log-returns of the indices - Dow Jones Industrial Average (DJIA) and Swiss Market Index (SMI) related to the period November 1990 - March 2009.

BANQUET
Friday evening, 8 May, 20:45
Rzeszowski Rynek

Saturday, 9 May

Session 3.1
Saturday morning, 9 May, 8:30
Chair: Dariusz Grech

8:30	Oral

Problem of rare events in modelling of the financial state of insurance company

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Modelling of the financial state of any insurance company requires the knowledge of the distribution of frequency of claims and the distribution of values of claims. The large claims and the average ones need to be considered independently. Rare large claims have significant influence on financial state of any insurance company. Their distribution may differ from the one inferred from the whole empirical sample of claims. We estimate the distribution of large claims by Maximum Likelihood Method by using the Extreme Value Theory.

8:55	Oral

Lifetime of correlations between stocks on established and emerging markets

Andrzej Buda

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The correlation coefficient between stocks depends on price history and includes information on hierarchical structure in financial markets. The lifetime of correlations between stock prices is introduced to find how far one should investigate price history to obtain the optimal durability of correlation for each pair of stocks. It is another efficient tool for a portfolio selection and estimation of risk. The mean lifetime of correlation (MLTC) and the standard deviation from MLTC is also analysed to detect optimal variety of correlations in portfolios. Theoretical background of the methods is discussed here from the practical point of view. This research is carried out on emerging (Poland, Hungary) and established markets (in the USA, UK, Japan and Germany) to compare the results and estimate the best possible price history used to compute correlation coefficients.

9:20	Oral

Study of households' income in Poland by using the statistical physics approach

Maciej R. Jagielski, Ryszard Kutner

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It was in the end of XIX century when Vilfredo Pareto as the first tried to analytically describe how the wealth and income are distributed in society. Following this pattern, early work by Pareto, Gibrat and Champernowne are presented (Laws of Pareto, Rules of Proportionate Growth, the Stochastic Model of Champernowne). Furthermore more recent and advanced models are reported: the Generalized Lotka-Volterra model and collision models. Finally, by using

Polish empirical data for annual income of household s for years 2000, 2003 and 2003, the comparison with theoretical predictions was made. The surprisingly good agreements with Pareto distribution were obtained (where Pareto exponents near the cubic law were found) for middle and higher classes. For lower class very good agreement with prediction of the cumulative log-normal distribution was gained. Hence, it was possible to establish the border between lower and middle society levels.

9:45	Oral

Share price movements as non-independent continuous-time random walk

Tomasz Gubiec[1], Ryszard Kutner[2]

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Simple model of share price evolution which is an extension of Kehr-Kutner-Binder model and Masoliver-Montero-Perello one is presented. Assumptions of the model are tested by using the market empirical data. Already in the simplest, exact solvable case, the model can reproduce some empirical facts, for example, the velocity auto-correlation function (vacf) however, the problem of existing the fat tail in the nonlinear vacf is still an open one.

10:10	Oral

Foreign currency network: its structure, evolution and subtle interactions

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We analyze the structure of the world foreign currency exchange market viewed as a network of interacting currencies. We analyze daily times series for a set of 40 independent currencies and gold (by independent currencies we mean currencies which are not explicitly pegged to any other currency). Our data spans the time period 1999-2008. We group together all the exchange rates with a common base currency and study each group separately. Essentially, our study goes into four directions: (i) we analyze topology of different network representations (i.e. for different base currencies) trying to identify roles played by distinct currencies in the world's currency system; (ii) we consider temporal evolution of the forex network and investigate the long-term trends alternating the network's structure; (iii) we deconstruct the data into sign and amplitude components in order to analyze impact of these components on global network structure and behaviour; (iv) we search for subtle effects of information transfer between distinct currency cross-rates, which can be identifiable at daily time scales.

Session 3.2
Saturday morning, 9 May, 11:00
Chair: Krzysztof Kułakowski

11:00	Oral

Scaling of human behavior in the portal browsing.

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We investigate the behavior of users at the web portal. We focus on the transitions between two subpages, using the information about the path of the users. We construct a weighted network whith portal subpages being its nodes and the weights of edges defined as a number of transition from a vertex to one of its neighbors. We scrutinize the properties of such a network as a distribution of weights and strenghts that corresponds to the power-law relation, as well as the statistics of users behavior. The latter brings interesting results: the average number of distinct subpages visited during the n-th step of a visit scales as a square root relation. Moreover, the way of choosing the next subpage and the browsing pattern at the portal can be understood as a special attracting walk on the weighted network. We show there is an agreement between the real data and the results of numeric simulation of attracting walk with the number of steps less than thirty. Finally, we use the rate equation to perform analytical calculation which fits the data from simulation

11:25	Oral

Non-extensive statistical mechanics of processes in computer systems Nie-ekstensywna mechanika statystyczna procesów w systemach komputerowych

Dominik Strzałka

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In presentation there will be shown a possible statistical mechanics of processes in computer systems considered as the complex ones. In the case of nowadays computer systems one can see that from one hand we have a growing complexity of processed input data but from the other hand one can also see a growing complexity of processing environment. Turing machine paradigm, which is commonly accepted as a mathematical model of almost all deliberations in computer science seems to be an "appriopraite" model of some deliberation due to the fact that this is only a mathematical idea that doesn't need energy for its normal work, while Turing machines implementations are physical systems that dissipate energy thus the problem of

their efficiency and entropy production apperas. In presentation it will be shown that in the case if one simple sorting algorithm (understood also as Turing machine) there are possibilities of existence non-extensive entropy production levels.

11:50	Oral

Anomalous interactions in network of Polish Football League

Andrzej Jarynowski[1,2], Janusz Miskiewicz[2]

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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 commited, estimating parameters of Kopocinski model(stochastic) to predict propability of appearance of non-sport intervention in investigated match; (4) using other nolinear measures of dependance to find anomalies. This research is dedicated to release Polish Football from problem of corruption.

12:15	Oral

Characterization fluctuations of trading volume on the Polish Stock Market

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The Polish Stock Market is relatively young creature yet the occurrent on her fluctuations of prices were the object of numerous investigations and analyses' many times. We examined, or existed regularities in probability distributions fluctuations of share prices firms captured in index WIG20, representing Polish Stock Market. One concentrated on analysis probability distributions of returns and probability distributions of trading volume 16 firms existing on boards WIG20 in period November 2000 till June 2005. One examined, or distributions of returns and distributions of trading volume are power-laws distributions, with exponents: 3 for returns and 3/2 for volumes. We leter checked, or indeed dependence appointed exponents generates curvature of price impact on level "gamma"=1/2.

LUNCH
Saturday afternoon, 9 May, 12:40

CLOSING
Saturday afternoon, 9 May, 13:40

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