

RESEARCH REPORT

of International Laboratory of Decision Choice and Analysis on the project «Mathematical modeling and mechanism design in social, economic and political spheres with using of methods of decision making, theory of games and intellectual data analyses», carried out within the framework of the Basic Research Program of the Higher School of Economics in 2012

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1 A BRIEF OVERVIEW

The aim of the project is a solution of some problems on mathematical modeling and mechanism design in social, economic and political spheres making use of the theory of social choice, game theory and data mining.

The main results of this project are presented in the following main research directions:

- 1) development and application of theoretical models for calculation of degree of voting manipulation;
- 2) study of organizational models and mechanisms;
- 3) investigation of game-theoretic models of elections to the board of directors of a company and axiomatic justification of single transferable voting rule;
- 4) game-theoretic approach to generalized bankruptcy problem;
- 5) efficiency analysis of banking and financial sectors of economy;
- 6) development of the theory of the importance of criteria and development of decision rules for ordinal multicriteria problems;
- 7) theoretical and experimental studies in cluster analysis and text document automated interpretation;
- 8) study of measures of informativeness that defined on sets of features of non-deterministic system;
- 9) study of models of fair division with an arbitrary number of participants, with divisible and indivisible goods;
- 10) development of the behavioral model of stock exchange;
- 11) application of game-theoretic techniques and methods of the theory of social choice to modeling of coalition's preferences and decision-making by political parties;
- 12) study and development of a model of the power indices as the elements of the projective space;
- 13) study of methods of choice and ranking of alternatives on the majority graph;
- 14) study of mathematical models of the choice of the university by applicants;
- 15) an university efficiency evaluation.

All of these directions of research are unified by a common "information" aspect. The calculation of degree of voting manipulation is concerned with research of distortion of information. The research of organizational models and mechanisms and research of the behavioral model stock exchange is associated with the use of online economic information. The development of the theory of the importance of criteria is connected to difficult formalizing (eg., experts) information. The studies in cluster analysis are connected to analyses of information with complex semantic structure. The studies of measures of informativeness are connected to investigation of methods of description of uncertainty of information. A research of a model of the power indices and methods of choice and ranking of alternatives is connected with aggregation of information.

Fundamental and applied results were made in every direction of project in different proportions.

The members of the Laboratory published 52 materials during the implementation of the project that including:

- 2 textbooks [Mirkin; Aleskerov et al. b (rus)];
- 3 monographs [Belenky a; Belenky b; Gusev et al. (rus)];
- 10 articles in peer-reviewed foreign journals and edited volumes;
- 14 articles in peer-reviewed Russian journals;
- 7 preprints of HSE.

2 MAJOR RESEARCH RESULTS

According to the requirements of the project new theoretical results were achieved in mathematical modeling and mechanism design in social, economic and political spheres with the use of the methods of the theory of choice, game theory and data mining. The results obtained can be conditionally attributed according the following directions.

2.1 DEVELOPMENT AND APPLICATION OF THEORETICAL MODELS FOR CALCULATION OF DEGREE OF VOTING MANIPULATION

Achievements in this direction:

- a) a software for generating of coalitional manipulability is developed;
- b) a coalitional manipulability of positional voting rules is studied;
- c) an individual manipulability is studied for Impartial Anonymous Culture;
- d) Nanson's rule and Inverse Borda rule are compared from the degree of manipulability point of view;
- e) a model of estimation of the degree of manipulability, freedom and efficacy of manipulation is elaborated in multiple choice framework;
- f) a decisiveness of voting rules is studied;
- g) a relation between manipulability and decisiveness are studied for some rules and for the case of the increasing number of voters;

- h) the maximal difference of probabilistic measures of social choice rules in IC and IANC (Impartial Anonymous and Neutral Culture model) is derived analytically;
- i) the difference of Nitzan-Kelly's index of manipulability in IC and IANC is calculated for four social choice rules.

The results of these researches are presented in [Karabekyan and Yakuba; Veselova; Aleskerov et al. b].

2.2 STUDIES OF ORGANIZATIONAL MODELS AND MECHANISMS

In this direction:

- a) two game theoretic models of organization of public-private partnerships were developed and the necessary and sufficient conditions of equilibrium in games are stated on the basis of these models;
- b) a mathematical model of the organization of the learning process of the student the university was developed; in this model the problem of optimization of the process of learning is formulated as a mathematical programming problem with mixed variables;
- c) mechanism for determining the winner in the one-step auction that reducing the chances of formation of corrupt links between the organizer and the participants in the auction bidding process developed and the mathematical properties of this mechanism are investigated.

The results of these studies are presented in [Belenky a, Belenky b, Belenky c, Belenky et al. (rus)].

2.3 INVESTIGATION OF GAME-THEORETIC MODELS OF ELECTIONS TO THE BOARD OF DIRECTORS OF A COMPANY AND CHOICE MODELLING THAT IMPLEMENT THE SINGLE TRANSFERABLE VOTING RULE

In this direction:

- a) game-theoretic models of elections to the board of directors of a company are considered and studied; the equilibrium in non-cooperative game of elections to the board of directors of a public company is described and manipulation of election is investigated;
- b) it is proved that the game that is describing the election of the board of directors implements the d'Hondt rule of proportional representation;
- c) a simulation model is developed that implements the following modifications of the single transferable voting rules: classic Gregory method, new our version of Gregory method extended Gregory method, the weighted Gregory method.

The results of these researches are presented in [Karpov a (rus); Karpov b (rus); Aleskerov and Karpov].

2.4 GAME-THEORETIC APPROACH FOR SOLUTION OF GENERALIZED BANKRUPTCY PROBLEM

In this direction:

- a) different games with interconnected system of debts are studied;
- b) various solutions are applied (core, sequential nucleolus);
- c) it is shown that the sequential nucleolus is the single valued solution of the generalized bankruptcy game.

The results of these researches are presented in [Karpov and Yurkov].

2.5 EFFICIENCY ANALYSIS OF BANKING AND FINANCIAL SECTORS OF ECONOMY PERFORMANCE

Within the area the following results were obtained:

- a) the determinant analysis was provided for the material risk risen in the financial system;
- b) key directions of proposed banking sector reforms have been studied (US and EU cases are considered);
- c) comprehensive analysis of banking business models has been made for small, medium and leading Russian commercial banks from 2006 till 2009;
- d) draft banking regulation parts have been analyzed and commented for the subjects:
 - capital requirements for transactions with central counterparts;
 - residential mortgage lending principles;
 - supervision of financial conglomerates;

Proposals for recovery plans work out with respect to Basel III requirements.

- e) multiplicative model of Countercyclical capital buffer is proposed, model parameters differentiation by groups of homogenous countries are justified;
- f) Basel II regulation implementation impact has been reviewed for the banking system of Russia assuming non-Gaussian distribution of material banking risks (credit, market, operational).

Research findings were presented in the following list of publications: [Usoskin and Belousova (rus); Usoskin et al. (rus); Aleksashin et al. (rus); Aleskerov et al. a; Andrievskaya, Penikas; Penikas and Lvov; Penikas and Nikitin; Penikas et al. a; Penikas et al. b; Penikas; Penikas and Titova; Nikitin et al. (rus); Penikas et al. a (rus); Penikas et al. b (rus); Penikas and Malkov (rus); Penikas (rus)].

2.6 DEVELOPMENT OF THE THEORY OF THE IMPORTANCE OF CRITERIA AND DEVELOPMENT OF DECISION RULES FOR ORDINAL MULTICRITERIA PROBLEMS

In this direction:

- a) analytical ordinal decision rule for problems with ordered by importance criteria with an ordinal scale is developed;

- b) the general optimization decision rule is developed for ordinal information about the importance of the criteria and the free from rounding errors specification is developed for criteria with the scale of the first order-metric;
- c) the interaction between qualitative and quantitative importance for multiobjective problems is investigated in which the criteria have the ordinal scale or ordinal scale of the first metric.

The results of these researches are presented in [Podinovski a; Podinovski a (rus); Podinovski b (rus); Nelyubin and Podinovski a; Nelyubin and Podinovski b; Nelubin and Podinovski (rus); Podinovski and Podinovskaya (rus); Podinovski and Potapov (rus)].

2.7 THEORETICAL AND EXPERIMENTAL RESEARCH IN CLUSTER ANALYSIS AND TEXT DOCUMENT AUTOMATED INTERPRETATION

In these directions:

- a) a series of experiments on splitting criteria and termination rules in divisive cluster analysis has been successfully conducted;
- b) concerning automated interpretation of text document collection (in Russian) in terms of taxonomy (in Russian, too) the following has been done:
 - we stated and proved that the VINITI taxonomy of Mathematics is inadequate, as it is shifted towards some fields of Mathematics and lacks of new concepts;
 - higher levels of the in-house taxonomy of Mathematics and Informatics were manually constructed according to the specialization normatives of Russian Higher Attestation Commission;
 - construction of the lower levels, based on Wikipedia sources, in an automated way began;
- c) a series of experiments for comparing reported and our own developed algorithms for consensus partitioning was started;
- d) special software for exploiting methods for multicriterion ranking and ABC partitioning, including our own algorithms, was developed and used for running tests;
- e) the problem of attributes generalization and refinement of objects hierarchical classification using provided attributes was studied.

The results of these studies are presented in [Nascimento and Mirkin; Mirkin and Amorim; Mirkin; Mirkin et al. (rus); Chernyak et al. (rus)].

2.8 STUDIES OF MEASURES OF INFORMATIVENESS THAT DEFINED ON FEATURES SETS OF NONDETERMINISTIC SYSTEM

In this direction:

- a) a stochastic geometric measures of informativeness on length are studied; these measures are defined on all sets of polygon representations of discrete stochastic noisy curve; asymptotic estimates of numerical characteristics of such measures have been obtained;

- b) various problems of finding the optimal with respect to different criteria of polygonal representations of curve with help of stochastic measure of informativeness by length have been stated and solved;
- c) the problem of the dependence of the stable of finding symmetry axes of objects on a noisy image with respect of the noise level have been investigated.

The results of these studies are presented in [Lepskiy; Lepskiy a (rus), Lepskiy b (rus)].

2.9 RESEARCH OF MODELS OF DIVISION FAIRNESS WITH AN ARBITRARY NUMBER OF PARTICIPANTS, WITH DIVISIBLE AND INDIVISIBLE ITEMS

In this direction:

- a) All the considered in the literature modifications of the fair division conditions are studied. The problems of finding fair divisions under various modifications of fairness notion are presented as optimization statements with a little set of essential constraints and goal functions, so that different statements differ in selection of subsets of constraint and goal functions.
- b) The suggested presentation finds out that there is a finite set of divisions such that all known modifications of the notion of fairness lead to different subsets of this set;
- c) Fair (in different sense) divisions can be found by a common algorithm that allows comparing them and selecting the most adequate to specific real circumstances in the framework of the single computational process.

The results of these researches are presented in [Rubchinskiy (rus)].

2.10 STUDIES OF THE BEHAVIORAL MODEL STOCK EXCHANGE

In this direction:

- a) we consider the problem of finding an optimal threshold that separates the events on the stock exchange, also we carry out the numerical calculations of finding such optimal threshold using different stock indices;
- b) we work on the construction of a simulation model of exchange according to all previously studied models;
- c) we study the extension of previous behavioral model exchange by embedding a model of player's decision-making process to the model and implementation of the Hawks process for the signals.

The results of these studies are presented in the works of [Egorova; Gorban and Egorova (rus); Aleskerov and Egorova].

2.11 APPLICATION OF GAME-THEORETIC TECHNIQUES AND METHODS OF THE THEORY OF SOCIAL CHOICE TO MODELING COALITION'S PREFERENCES AND DECISION-MAKING BY POLITICAL PARTIES

In this direction:

- a) A generalization is proposed of the probabilistic voting model in two-candidate elections. It is assumed that the candidates have general von Neumann-Morgenstern utility functions defined over the voting outcomes. It is shown that unless strict symmetry conditions on the candidate payoff functions are satisfied, a convergent equilibrium where both candidates select the same policy position exists for a non-generic set of voter's probability of voting functions.
- b) We study the power distribution among members of Politburo of the USSR in 1923-1931 taking into account agents' preferences to coalition formation, we also address to a problem of missing data imputation.

The results of these studies are presented in [Zakharov; Zakharov and Sorokin].

2.12 STUDIES OF THE POWER INDICES AS THE ELEMENTS OF THE PROJECTIVE SPACE

In this direction:

- a) the analysis and classification of the paradoxes of voting power are studied;
- b) the axiomatic approach is proposed to the problem of stability of cartel agreements and construct the corresponding model.

The results of these studies are reflected in [Schwartz a (rus); Schwartz b (rus); Schwartz and Zakharov (rus)].

2.13 STUDIES OF CHOICE METHODS AND RANKING OF ALTERNATIVES ON THE MAJORITY GRAPH

In this direction:

- a) set-theoretic relations of some tournament solutions (and their versions) for the optimal social choice problem and algorithms for their calculation have been refined, as well as the algorithms for calculation of related rankings; thus it enabled us to upgrade existing software and to create some new programs for the computation of these tournament solutions and rankings;
- b) a number of social choice methods (aggregation based on majority rule, Copeland rule, Markov method, sorting based on such tournament solutions as the uncovered set and the minimal externally stable set) have been applied in a multicriterial problem for construction of a single ranking that aggregate contradicting rankings based on a single criterion. Aggregate rankings were calculated for 158 countries ranked by the level of their democratic development as measured by the following indices and rankings: Democracy Index - The Economist, index Polity IV, Vanhanen index, Voice & Accountability index (World Governance Indicators), Index of the Institutional Foundations of Democracy, comparative correlation analysis of the single-index and aggregate rankings has been carried out;
- c) ranking methods based on Markov chains have been studied;

- d) while constructing alternative versions of the ranking countries by the level of their economic competitiveness an algorithm for clustering of alternatives located in an n-dimensional rank space has been developed.

The results of the studies are presented in [Aleskerov and Subochev; Subochev (rus); Aleskerov et al. a (rus)].

2.14 MATHEMATICAL MODELS OF THE CHOICE OF THE UNIVERSITY BY APPLICANTS

In this direction:

- a) A classic model of stable matching has been extended to the preferences being semiorders;
- b) College admissions are studied with stable score-limits as a type of stable matching model with semi-fixed quotas. Quotas are broken in order to satisfy 'equal treatments of equals' principle. Two versions of the model are considered: with lower quota and with higher quota.
- c) Matching mechanism applications in different countries and regions have been studied.

The results of the studies are presented in [Kiselgof (rus); Kiselgof a; Kiselgof b].

2.15 AN UNIVERSITY EFFICIENCY EVALUATION

In this direction:

- a) We have investigated an efficiency of Russian universities based on data set of input and output criteria by using Data Envelopment Analysis;
- b) First time the reputation index has been used as another indicator of a university's productivity.

The results of the studies are presented in [Abankina et al.; Abankina et al. (rus)].

2.16 DEVELOPMENT OF RULES OF A CHOICE FOR A LARGE NUMBER OF ALTERNATIVES

In this direction:

- a) A set of interval superposition algorithms accompanied with ranking model for its further application to search engines has been developed and tested on real data.
- b) Several clustering algorithms (tunnel clustering, interval clustering, KRAB-family algorithms, k-means) were optimized and adopted to large volumes of multidimensional data.

3 MAJOR ORGANIZATIONAL RESULTS

3.1 ORGANIZATION AND CARRYING OF DeCAN LABORATORY SEMINARS AND ALL-MOSCOW SCIENTIFIC SEMINAR "MATHEMATICAL METHODS OF ANALYSIS OF OPTIMAL SOLUTIONS IN ECONOMICS, BUSINESS AND POLITICS"

Over a period from January to December 2012, 7 sessions of the DeCAN Laboratory seminar were held and the following reports were presented:

- 14 December** – Sandro Lucci (University of Rome "Tor Vergata") "Distribution of influence in the International Monetary Fund";
- 28 June** – A. Karpov (Junior Research Fellow, DeCAN Laboratory) and S. Urkov (MA student NRU-HSE) "The solution of the generalized bankruptcy problem";
- 20 June** – E. Mitichkin and S. Shvydun (Research Intern, DeCAN Laboratory) "Ranking algorithms and their application in the problems of Information retrieval";
- 26 April** – J. Kupriyanov (Lecturer, Faculty of Business Informatics) "Models and methods of organizational transformation enterprise information systems";
- 19 March** – E. Shomova (Postgraduate Student, Faculty of Business Informatics) "Optimization of financing of complex of innovative projects";
- 6 February** – S. Saltykov (ICS RAS) "Comparative analysis of the methods of weighted sum, of the utility theory and the theory of the importance of criteria for solutions multicriteria problems with a scores criteria";
- 16 January** – N. Pilnik (Postgraduate Student, Faculty of Economics) "Modeling of interaction of the owner and his company in the frame of dynamic general equilibrium models".

Over a period from January to December 2012, 11 sessions of the All-Moscow scientific seminar "Mathematical methods of analysis of optimal solutions in economics, business and politics" were held and the following reports were presented:

- 19 December** – E. Maskin (Chief Research Fellow, DeCAN Laboratory);
- 21 November** – A. Shananin (MIPT), M. Vaschenko (MIPT) "Analysis of financial pyramids and capital movements based on the model Cantor-Lipman";
- 17 October** – A. Bronevich (NRU-HSE) "Uncertainty measures in the theory of imprecise probabilities";
- 19 September** – I. Zutler "Probabilistic preferences in cumulative theory of prospects";
- 20 June** – V. Evstigneev (NRU-HSE) "Probabilistic picture of the world: how is born and evolved intuitive perception of price process by players on the currency market";
- 16 May** – B. Mirkin (Leading Research Fellow, DeCAN Laboratory) "Problems intellectualization of K-Means method in cluster analysis";

- 24 April** – J. Mandel (information service TELMAR) “Modeling in marketing: unresolved problems”;
- 18 April** – E. Winter (Silverzweig Professor of Economics, Director of the Center for the Study of Rationality the Hebrew University of Jerusalem) “Emotions, Mental Equilibrium and Mind Reading”;
- 21 March** – A. Zakharov (Senior Research Fellow, DeCAn Laboratory) “Violations and monitor in the elections to the State Duma in 2011 and the Presidential Elections 2012”;
- 5 February** – A. Vasin (MSU) “A model to suppress of corruption”;
- 18 January** – M. Timonin (MPEI) “Search methods of extreme values of Choquet integral and its application in multicriteria problems of resource allocation”.

3.2 ORGANIZATION OF SUMMER SCHOOL

The faculty of the Laboratory jointly with the Banking Institute with the support of the Center of Fundamental Research and Ltd. "CB" MEZHTRASTBANK organized Summer school “Modern Models in Market Analysis”, which was held from June 25-27, 2012. At the school the lectures were delivered by Prof. R. Tyrrell Rockafellar (University of Washington, Seattle, USA) and Prof. Stan Uryasev (Director of the Risk Management and Financial Engineering Lab and director of PhD Program with Concentration in Quantitative Finance at the University of Florida). The more detailed information is given in Annex 2.

3.3 PARTICIPATION IN ORGANIZATION AND CARRYING OF CONFERENCES

3.3.1 Organization of international workshop “Clusters, orders, trees: methods and applications”

The faculty of the Laboratory organized international workshop “Clusters, orders, trees: Methods and applications” in Honor of the 70th Anniversary of Boris Mirkin, Professor Ordinarius (NRU HSE), Professor Emeritus (University of London UK), Leading Research Fellow in the International Laboratory of Decision Choice and Analysis (DeCAn Lab), and Chief Researcher in the Laboratory of Algorithms and Technologies for Networks Analysis (LATNA), which was held from December 12-13, 2012. The workshop will take place on December 12-13, 2012. The more detailed information is given in Annex 2.

3.3.2 Participation in organization of conferences

Laboratory staffs were actively involved in organizing a number of conferences:

1. XIII HSE International Academic Conference on Economic and Social Development, 3-5 April 2012, NRU-HSE, Moscow, Russia, <http://conf.hse.ru/2012/>:

- Aleskerov F.T. – Deputy Chairman of the Program Committee, Head of a section, Chairman of session;
- Zakharov A.V. – Head of a section, Chairman of session;

- Penikas H.I. – Chairman of session;
- Subochev A.N. – Chairman of session;
- Belousova V.J. – Organizer of round tables;
- Veselova J.A. – Secretary of section.

2. XXXX International conference “Information technologies in science, education, telecommunications and business” (Ukraine, Crimea, Yalta-Gurzuf, May 25 - June 4, 2012):

Podinovski V.V. – Plenary speaker, Head of a section.

3. International Workshop on Experimental Economics and Machine Learning (EEML) in conjunction with ICFCA 2012 (6-10 May 2012, Leuven, Belgium). <http://www.econ.kuleuven.be/icfca/workshopEeml.html>

Karabekyan D., Kiselgof S.G., Karpov A.V. – members of the Program Committee.

4. 11-th Meeting of Society for Social Choice and Welfare, Delhi, Indian, August 17-20, 2012, <http://www.isid.ac.in/~sscw2012/Welcome.html>

Veselova J.A. – Chairman of a session.

5. Fourth Congress of the Game Theory Society (GAMES 2012), Istanbul, Turkey, July 21 - 27, 2012, <http://games2012.bilgi.edu.tr/>

Karpov A.V. – Chairman of a session.

6. The Second MIT Presidential Election Conference “Does the Current Presidential Election System Serves America Well?” October 19, 2012, Cambridge, Massachusetts, U.S.A., <http://cesf.mit.edu/electoral2012/program.html>:

- Belenky A.S. – Chair of the Program Committee, the moderator of the two break-out sessions, the speaker;
- Maskin E. – Plenary speaker, break-out session moderator.

7. International Workshop on Next Generation of Intelligent Medical Decision Support Systems (Bulgaria, Sofia, 10-11 July 2012) http://rcvt.tu-sofia.bg/meddecsup2012/invited_speakers.html:

Mirkin B.G. – Plenary speaker.

8. XXXX International Conference “Information Technologies in science, education, telecommunications and business” (Ukraine, Crimea, Yalta-Gurzuf, fall session, 1-10 October, 2012), <http://conf.omgtu.ru/>:

Podinovski V.V. – member of the Program Committee, Head of a section.

3.4 THE DEVELOPMENT OF SCIENTIFIC COMMUNICATION, INCLUDING SUPPORT OF INTERNATIONAL SCIENTIFIC COOPERATION IN THE FIELD OF BASIC RESEARCH

The development of scientific (including international) contacts was carried out in the form of participation of the staff of the laboratory that works on the project in a number of conferences. The list of presentations made at workshops and conferences is given in Annex 3.

3.5 ACTIVITIES FOR STAFF DEVELOPMENT OF THE LABORATORY

Two PhD theses were prepared and defended:

- Karabekyan D. Manipulation in the problem of collective decision-making (Supervision – F.T. Aleskerov);
- Karpov A.V. Ordinal models of systems of proportional representation (Supervision – F.T. Aleskerov).

A series of mini-courses of lectures were conducted. The list of mini-courses of lectures is given in Annex 4 (Table 1).

Chief Research Fellow of Laboratory Eric S. Maskin gave a series of lectures on the course “Design mechanisms”, May 25-28, 2012.

4 OTHER INFORMATION

On the whole, problems proposed in the project have been solved. At the same time, some problems should be formulated more precisely. A number of new problems are stated and solved. Thus we believe that research in these directions should be continued.

Head of the Project

F.T. Aleskerov

ANNEX 1

PUBLICATIONS AND PAPERS, FEATURING THE RESULTS OF THE PROJECT

- [**Abankina et al.**] Abankina I., Aleskerov F., Belousova V., Osmolovskaya A., Petruschenko V., Ogorodniychuk D., Yakuba V., Zinkovsky K. University efficiency evaluation with using its reputational component// Lecture Notes in Management Science (2012), Tadbir Operational Research Group Ltd. ISSN 2008-0050 (Print), ISSN 1927-0097 (Online), Vol. 4: p.244–253.
- [**Aleskerov and Egorova**] Aleskerov F., Egorova L. Is it so bad that we cannot recognize black swans? (Economic Letters, том 117, выпуск 3, 2012г. – с.563-565. doi:10.1016/j.econlet.2012.04.078).
- [**Aleskerov and Karpov**] Aleskerov F., Karpov A. A new single transferable vote method and its axiomatic justification // Social choice and welfare, 2012.
- [**Aleskerov and Subochev**] Aleskerov F., Subochev A. Modeling optimal social choice: matrix-vector representation of various solution concepts based on majority rule // Journal of Global Optimization. 2012. DOI 10.1007/s10898-012-9907-2.
- [**Aleskerov et al. a**] Aleskerov F.T., Keskinbaev A., Penikas H. A Multiplicative Model of Countercyclical Capital Buffer Evaluation Differentiated by Homogeneous Clusters of Countries // HSE Series: Financial Economics WP BRP 04/FE/2012 – 15p.
- [**Aleskerov et al. b**] Aleskerov F.T., Karabekyan D., Sanver R.M., Yakuba V. On the manipulability of voting rules: The case of 4 and 5 alternatives // Mathematical Social Sciences 64, 2012, p.67–73.
- [**Andrievskaya, Penikas**] Andrievskaya I.K., Penikas H.P. Copula-Application to modeling Russian banking system capital adequacy according to Basel II IRB-approach // Model Assisted Statistics and Applications, Vol.7, No.4, 2012, p.267–280.
- [**Belenky a**] Belenky A.S. Understanding the Fundamentals of the U.S. Presidential Election System. – Springer, 2012, 444p.
- [**Belenky b**] Belenky A.S. Who Will Be the Next President? A Guide to the U.S. Presidential Election System – Springer, 2013, 137p.
- [**Belenky c**] Belenky A.S. A Boolean programming problem of choosing an optimal portfolio of projects and optimal schedules for them by reinvesting within the portfolio the profit from project implementation // Applied Mathematics Letters, 2012, 25, No.10. pp.1279-1284.
- [**Ignatov et al.**] Ignatov D., Kaminskaya A., Bezzubtseva A., Chernyak E., Blinkin K., Nedumov D., Chugunova O., Konstantinov A., Romashkin N., Strok F., Goncharova D., Yavorsky R. Crow DM: the System for Collaborative Platform Data Analysis// In book: EEML 2012 – Experimental Economics in Machine Learning. Leuven, Catholic University of Leuven, 2012. p.61-71.
- [**Karabekyan and Yakuba**] Karabekyan D., Yakuba V. Weak manipulability of voting rules. (prepared for publication)

- [**Karpov and Yurkov**] Karpov A., Yurkov S. Generalized bankruptcy problems/ HSE Series: Economics WP BRP 08/FE/2012, – 12p.
- [**Kiselgof a**] Kiselgof S. Matchings with simplest semiorders (prepared for publication).
- [**Kiselgof b**] Kiselgof S. College admission with stable score-limits (prepared for publication).
- [**Lepskiy**] Lepskiy A. Stochastic measure of informativity and its application to the task of stable extraction of features // Synergies of soft computing and statistics for intelligent data analysis, AISC 190, Springer-Verlag, Berlin Heidelberg, 2013, pp.553-561, DOI:10.1007/978-3-642-33042-1_59.
- [**Mirkin and Amorim**] Mirkin B.G., Amorim R. Minkowski metric, feature weighting and anomalous cluster initializing in K-Means clustering // Pattern Recognition, 2012. No.45. p.1061-1075.
- [**Mirkin**] Mirkin B.G. Clustering: A Data Recovery Approach // Chapman&Hall/CRC Press, 388p. (to appear 2012)
- [**Nascimento and Mirkin**] Nascimento S., Mirkin B.G. Additive spectral method for fuzzy cluster analysis of similarity data including community structure and affinity matrices // Information Sciences, 2012, No.183. p.16-34.
- [**Nelyubin and Podinovski a**] Nelyubin A.P., Podinovski V.V. On the relationship between qualitative and quantitative importance of criteria in multicriterial decision making problems// In: Several Problems of Applied Mathematics and Mechanics / I. Gorgidze, T. Lominadze (Eds.). USA: Nova Science Publishers, 2012, p.51-66.
- [**Nelyubin and Podinovskiy b**] Nelyubin A.P., Podinovskiy V.V. Algorithmic decision rule using ordinal criteria importance coefficients with a first ordinal metric scale // Computational Mathematics and Mathematical Physics, 2012. No.1. p.43-59.
- [**Penikas and Lvov**] Penikas H.I., Lvov N.P. Comments on The Basel Committee on Banking Supervision Consultative Document “Bank’s Internal Audit Function” // 2012. Internet publication.
- [**Penikas and Nikitin**] Penikas H.I., Nikitin A.A. Comments on The Basel Committee on Banking Supervision Consultative Document “Application of Own Credit Risk Adjustments to Derivatives” // Bank for International Settlements WebSite, 2012. Internet publication.
- [**Penikas et al. a**] Penikas H.I., Andrievskaya I.K., Lvov N.P. Comments on The Basel Committee on Banking Supervision Consultative Document “Core principles for effective banking supervision” // Bank for International Settlements WebSite, 2012. Internet publication.
- [**Penikas et al. b**] Penikas H.I., Grigoriev D.V., Semenova M.V. Comments on The Basel Committee on Banking Supervision Consultative Document “Definition of Capital Disclosure Requirements” // Bank for International Settlements WebSite, 2012. Internet publication.
- [**Penikas**] Penikas H.I. An optimal incentive contract preventing excessive risk-taking by a bank manager // HSE Series: Financial Economics WP BRP 04/FE/2012, - 13 p.

- [**Penikas and Titova**] Penikas H.I., Titova Y. Modeling policy response to global systemically important banks regulation // HSE Series: Financial Economics WP BRP 04/FE/2012, - 25 p.
- [**Podinovskiy**] Podinovskiy V.V. Sensitivity analysis for choice problems with partial preference relation // European journal of operational research, 2012, V.221, No.1. p.198-204.
- [**Veselova**] Veselova Y.A. The difference between manipulability indexes in IC and IANC models // HSE Series: Economics WP BRP 09/E/2012, – 25p.
- [**Zakharov**] Probabilistic voting equilibria under nonlinear candidate payoffs // Journal of Theoretical Politics, 2012. No.24. p.235-247.
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- [**Gorban and Egorova (rus)**] Gorban I.A., Egorova L.G. The optimal threshold in the problem of separating events (prepared for publication, in Russian).
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- [**Karpov a (rus)**] Karpov A.V. Model of voting in the election of board of directors of company // XII HSE April International Academic Conference on Economic and Social Development. V.2. M.: HSE. 2012. p.266-273. (in Russian)
- [**Karpov b (rus)**] Karpov A.V. Cumulative voting in the election to the Board of Directors// Journal of the New Economic Association (on reviewing, in Russian)
- [**Kiselgof (rus)**] Kiselgof S.G. Modeling admission campaign: colleges of varying quality and entrants with a quadratic utility function // Problems of Control, No.5, 2012. (in Russian)
- [**Lepskiy a (rus)**] Lepskiy A.E. Determining the parameters of the symmetry of objects in the noisy image // Pattern Recognition and Image Analysis (on reviewing, in Russian).
- [**Lepskiy b (rus)**] Lepskiy A.E. Application of stochastic monotone measures in the problem of informative features of contour images // International conference "Intelligent Information Processing" IIP-9, Montenegro, Budva, September 16–22, 2012. M.: Torus Press, 2012. 718p. ISBN 978-5-94588-119-8 c.358-361. (in Russian)
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- [**Nikitin et al. (rus)**] Nikitin A.A., Penikas H.I., Semenova M.V. Analysis of proposals to adjust to changes in capital's own credit risk // Banking, 2012. No.4. p.58-62. (in Russian)
- [**Penikas et al. a (rus)**] Penikas H.I., Andrievskaya I.K., Lvov N.P., Malkov E.S. Analysis of proposals to reserve capital for transactions with CCPs // Banking, 2012. No.2. p.18-24. (in Russian)
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- [**Penikas and Malkov (rus)**] Penikas H.I., Malkov E.S. Analysis of proposals for the supervision of financial conglomerates // Banking, 2012. No.5. p.30-32. (in Russian)
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- [**Podinovski a (rus)**] Podinovski V.V. Dual ordinal decision rule for ranked by importance of criteria in multicriteria decision-making problems // Modern problems informatization in the analysis and synthesis of technology and software- telecommunications systems. Proceedings. 17. Voronezh: Scientific book, 2012. p.273-275. (in Russian)

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- [**Podinovski and Podinovskaya (rus)**] Podinovski V.V., Podinovskaya O.V. New ordinal decision rules in the theory of the importance of the criteria // In proc. of conf. XXXX International Conference "Information Technologies in science, education, telecommunications, and business" (Ukraine, Crimea, Yalta Gurzuf, fall session, 1-10 October, 2012). Supplement to «Open Education». Zaporozhye: Zaporizhye National University, 2012. p.49-51. (in Russian)
- [**Podinovski and Potapov (rus)**] Podinovski V.V., Potapov M.A. Importance of criteria in multicriteria decision problems: theory, methods, software, and applications // Open Education. 2012. No.2. p.55-61. (in Russian)
- [**Rubchinskiy (rus)**] Rubchinskiy A.A. Quasifair division of with several participants // XIII HSE April International Academic Conference on Economic and Social Development. M.: HSE. 2013. (prepared for publication, in Russian).
- [**Subochev (rus)**] Subochev A.N. Measuring Democracy: the aggregation of conflicting rankings of the world using the theory of social choice // Preprint (prepared for publication, in Russian).
- [**Usoskin and Belousova (rus)**] Usoskin V.M., Belousova V.J. Payment systems and organization of settlements in a commercial bank // Moscow: HSE Pub., 2012. 190p. (in Russian)
- [**Usoskin et al. (rus)**] Usoskin V.M., Klintsova M.V., Belousova V.J. International experience in banking sector regulation // Management of the credit organization, 2012. No.1 (65). p.24-41. (in Russian)
- [**Vasiliev et al. (rus)**] Vasiliev S., Aleskerov F., Ivanov A., Yakuba V. Economic decision-making mechanisms for utilization of associated petroleum gas // Problems of control, 2012, No.4, p.18-25. (in Russian)
- [**Shvarts a (rus)**] Shvarts D.A. Axiomatics of power indices in the problem of voting with quota // Problems of control, 2012. No.1. p.33-41. (in Russian)
- [**Shvarts b (rus)**] Shvarts D.A. On the measure of the total balance of symbolic graphs // Preprint (prepared for publication, in Russian).
- [**Shvarts and Zakharov (rus)**] Shvarts D.A., Zakharov A.V. Cartel stability: no coalition approach // Automation and Remote Control (on reviewing, in Russian).

ANNEX 2

LIST OF WORKSHOPS, CONFERENCES AND SUMMER SCHOOLS ORGANIZED BY PROJECT PARTICIPANTS

1. Summer school “Modern Models in Market Analysis”

The faculty of the Laboratory jointly with the Banking Institute with the support of the Center of Fundamental Research and Ltd. "CB" MEZHTRASTBANK" organized Summer school “Modern Models in Market Analysis” (<http://binst.hse.ru/svd/cnt/news/tperiodicdocument193050>), which was held from June 25-27, 2012. 32 faculties from the Laboratory and other departments participated in the Summer school. The lectures were delivered by

- Prof. R. Tyrrell Rockafellar (University of Washington, Seattle, USA);
- Prof. Stan Uryasev (Director of the Risk Management and Financial Engineering Lab and director of PhD Program with Concentration in Quantitative Finance at the University of Florida).

There were discussions of the reports and consultations of the speakers with the participants of the Summer school.

2. International workshop “Clusters, orders, trees: Methods and applications”

The faculty of the Laboratory organized International workshop “Clusters, orders, trees: Methods and applications” in Honor of the 70th Anniversary of Boris Mirkin, Professor Ordinarius (NRU HSE), Professor Emeritus (University of London UK), Leading Research Fellow in the International Laboratory of Decision Choice and Analysis (DeCAN Lab), and Chief Researcher in the Laboratory of Algorithms and Technologies for Networks Analysis (LATNA), which was held from December 12-13, 2012. The workshop will take place on December 12-13, 2012.

Key presentations:

- Prof. Fuad Aleskerov (NRU HSE, Russia);
- Prof. Trevor Fenner (University of London, UK);
- Prof. Boris Goldengorin (NRU HSE Nizhniy Novgorod, Russia);
- Prof. Valery Kalyagin (NRU HSE Nizhniy Novgorod, Russia);
- Prof. Vladimir Makarenkov (Universite de Montreal, Canada);
- Prof. Fred McMorris (IIT, Chicago, USA);
- Dr. Susana Nascimento (New University of Lisbon, Portugal);
- Prof. Panos Pardalos (University of Florida, USA);
- Prof. Fred Roberts (Rutgers University, New Jersey, USA);
- Dr. Ito Wasito (University of Indonesia, Indonesia).

ANNEX 3

List of presentations made at workshops and conferences

1. Seminar Laboratory of algorithms and analysis technology networks (HSE NN), January 12, 2012, Nizhny Novgorod:
Aleskerov F., (with Subochev A.) Modeling optimal social choice: matrix-vector representation of various solution concepts based on majority rule.
2. Session of the Presidium of Russian Academy of Sciences, January 31, 2012, Moscow
Aleskerov F. Social choice theory.
3. Winter School for applicants on the Master's degree in "Mathematical Modeling", HSE, Moscow, February 2, 2012:
Aleskerov F. Applied models for practical applications in business.
4. Master class at the University of Inholland (Netherlands), February 6-10, 2012:
 - Belousova V. The Evolution of Large-Value Payments: Global and Russian Trends;
 - Belousova V. Recent Developments in Russian and European Retail Payments Landscape».
5. Conference on "Analysis of Images, Networks and Texts" (AINT-2012), March 16-18, 2012, Yekaterinburg, www.aistconf.org
Chernyak E., Chugunova O., Mirkin B. (with Askarova J., Nascimento S.) Automation of using of taxonomy to annotate text documents.
6. Student Scientific Conference "e-Business. Management of Internet projects", HSE, March 22-23, 2012, <http://www.bi-network.ru/>:
Ivanov A. Automating the analysis and processing of information flow by using the analysis of web pages.
7. Seminar Laboratory of game theory and decision-making of the St. Petersburg Economics and Mathematics Institute RAS, St. Petersburg, March 23, 2012, http://emi.nw.ru/labor/lab_yanovska.htm:
Karpov A. Ordinal model of systems of proportional representation.
8. Round table "Development of financial market institutions and regulation of their activities," March 29, 2012, the Finance Academy under the Government of the Russian Federation:
Belousova V. (with Usoskin V., Klintsova V.) International experience in banking sector regulation.

9. Round table "Development of Financial Market Institutions and the regulation of their activities", Moscow, Russia, March 29, 2012:

Penikas H. (with Lvov N., Titova J.) Modeling the effects of a global regulation of systemically important banks.

10. XIII HSE International Academic Conference on Economic and Social Development, April 3-5, 2012, NRU-HSE, Moscow, Russia, <http://conf.hse.ru/2012/>:

- Aleskerov F., Egorova L. Behavioral model of stock exchange;
- Aleskerov F., Belousova V., Petruschenko V. (with Abankina I., Bonch-Osmolovskaya A., Gorodentseva T., Knyazev E., Kogan J., Ogorodniychuk D., Zin'kovsky K.) Picture of high schools in the light of data from structured and unstructured sources;
- Aleskerov F., Subochev A. (with Perederina O., Pislyakov V.) Ranking of political science journals;
- Gizinger J., Karachunskiy I. Simulation modeling of the rules of transfer of voices;
- Ivanov A. Analysis of manipulability of Nanson voting rule and inverse procedure of Board;
- Karabekyan D. Weak and strong manipulation of decision rules using the majority relation;
- Karpov A. Are corporate board elections non-manipulable?;
- Kisel'gov S. Distribution of students at universities in the preferences, is the simplest semi order: stability and Pareto optimality;
- Penikas H. Construction of the optimal contract, which stimulates the failure of excess risk of the bank managers;
- Rubchinskiy A. Quasi fair division with several participants;
- Schvarts D. Power indices as elements of the projective space;
- Zakharov A. The importance of economic issues in politics: cross-country analysis.

11. International scientific conference "Lomonosov-2012", Section 6, "Information technology and systems in the strategy of the Russian organization", Moscow, Russia, April 19, 2012:

Penikas H. (with Kupriyanov J.) Formal model of IT implementation project: the relationship of organizational, technological and financial aspects.

12. Second International Conference on Network Analysis 2012, HSE NN, May 7-9, 2012, Nizhny Novgorod, <http://nnov.hse.ru/latna/conferences/net2012>:

- Aleskerov F., Egorova L. Behavioral model of stock exchange;
- Mirkin B. How to visualize and interpret a fuzzy entity set over a taxonomy of the domain (Invited plenary report);

- Rubchinskiy A. A New Algorithm of Network Decomposition and its Application for Stock Market Analysis.

13. Master classes at the campus of the Perm HSE, May 10-11, 2012:

- Belousova V. Russian banks: financial intermediation, business model, efficiency and ownership structure;
- Belousova V. (with Usoskin V.) The evolution of payment systems: a compromise between liquidity and risk;
- Belousova V. (with Usoskin V.) Global trends in payment systems.

14. 3rd International Workshop “Models of Influence and Network Theory” (MINT3), May 14-15, 2012, Paris, France,

<http://ces.univ-paris1.fr/membre/seminaire/MINT/MINT.htm>

- Aleskerov F. New Decision Concepts and their use to evaluate a Vigor of Agents in Large Networks;
- Mitichkin E. Interval superposition approach and its use to the choice of options in the problem of search;
- Shvydun S. Over-lath superposition algorithm and its use to the ranking of options in the problem of search.

15. 3rd International scientific and practical conference of students and postgraduate students "Statistical methods for analysis of the economy and society", May 15-16, 2012, Moscow, HSE, <http://statistics.hse.ru/studconf>:

Kamalova R. Level of economic development as a factor in the level of democracy in post-communist states.

16. Seminar of All-Russian Society for Artificial Intelligence, Polytechnic Museum, Moscow, May 16, 2012:

Mirkin B. Intellectualization of K-Means in cluster analysis.

17. Conference "Frontiers of Market Design: Matching Markets", May 20-23, 2012, Ascona, Switzerland, <https://sites.google.com/site/frontiersmarketdesign/>

Kiselgof S. College admissions with stable score-limits.

18. An external seminar "The academic environment: the development of scientific competence of teachers in-service training at high professional potential HSE", Zvenigorod, May 27, 2012, <http://academics.hse.ru/news/53570643.html>:

- Aleskerov F. There is only one step from theory to applied research;
- Maskin E. Mechanism Design Theory: How to Implement Social Goals.

19. XXXX International Conference, X International Conference of young scientists "Information technologies in science, education, telecommunications and business» IT + S & E`12. Ukraine, Crimea, Yalta Gurzuf. May 25 – June 4, 2012, <http://www.gloriozov.com>

Podinovski V. Importance of criteria in multicriteria decision problems: theory, methods, software, applications (plenary report).

20. 2nd Stochastic Modeling Techniques and Data Analysis International Conference (SMTDA2012), Chania, Crete, Greece, June 5 - 8, 2012, <http://www.smta.net>

Lepskiy A. Solution of Problem of Stable Extraction of Features with Using of Measure of Informativeness.

21. VIII-th International Workshop "Multivariate statistical analysis and econometrics", June 26 – July 6, 2012, Tsakhkadzor (Armenia), http://www.cemi.rssi.ru/news/science/index.php?ELEMENT_ID=3988:

- Kamalova R. The level of economic development of the state as a factor of democracy of political regime;
- Penikas H. (with Merikas A., Merika A.) Dry Bulk Ship Time Charter Rates Term Structure Modeling.

22. 87th Annual Conference of Western Economic Association International, USA, San Francisco, June 28 - July 3, 2012, <http://www.weai.org>

- Egorova L. Behavioral model of stock exchange;
- Karabekyan D. Preferences over the Sets of Alternatives and Problem of Manipulation in Voting.

23. Seminar Laboratory of algorithms and analysis technology networks (HSE NN), July 2, 2012, Nizhny Novgorod:

Aleskerov F., On several applied problems.

24. The 8-th Spain Italy Netherlands Meeting on Game Theory, Budapest, Hungary, July 16-18, 2012, <http://sing8.iehas.hu/>

Kiselgof S. (with Biro P.) College admissions with stable score-limits.

25. Fourth Congress of the Game Theory Society, Istanbul, Turkey, July 21-27, 2012, <http://games2012.bilgi.edu.tr/>

Karpov A. Game-theoretic justification of the d'Hondt method.

26. Conference "Statistical Models in Business and Finance", St.Paul, USA, August 5-10, 2012:

Penikas H. Copula Models in Banking and Finance. Methodological Issues of Copula Choice: goodness-of-fit versus goodness-of-forecast.
<http://cam.mathlab.stthomas.edu/pdf/ISR/PenikasW.pdf>

27. International Public Procurement Conference, Seattle, Washington, U.S.A. August 17-19, 2012, <http://www.ippa.org/>

Belenky A. Finding optimal procurement strategies under risks.

28. 11-th Meeting of Society for Social Choice and Welfare, New Delhi, India, August 17-20, 2012, <http://www.isid.ac.in/~sscw2012/Welcome.html>

- Karabekyan D. (with Yakuba V.) Weak Manipulability of Voting Rules;
- Karpov A. A new single transferable vote method and its axiomatic justification;
- Kiselgof S. (with Biro P.) College admissions with stable score-limits;
- Sorokin K. (with Zakharov A.) Policy convergence in a two-candidate probabilistic voting model;
- Veselova J. The difference of manipulability indexes in IC and IANC model.

29. Seminar of the St. Petersburg Economic Mathematical Institute RAS, September 14, 2012:

Aleskerov F. Power in Organizations: Theory and Applications.

30. 9th International conference “Intelligent Information Processing” IIP-9, Montenegro, Budva, September 16–22, 2012, <http://www.mmro.ru/>

Lepskiy A. Application of stochastic monotone measures in the problem of informative features of contour images.

31. Professional Conference, "Financial Reporting of credit institutions. Major Challenges and Priorities CFO", October 1-2, 2012:

<http://banking2012.financialreporting.ru/timeline/>

Penikas H. Modeling hedge.

32. 6th International Conference on Soft Methods in Probabilities and Statistics, Konstanz, Germany, October 4-6, 2012, <http://fuzzy.cs.uni-magdeburg.de/smeps2012/index.html>

Lepskiy A. Stochastic measure of informativity and its application to the task of stable extraction of features.

33. Mathematical society on Control/Management and Applied Mathematics department of MIPT, October 9, 2012:

Aleskerov F. Distribution of power in elected bodies.

34. Round Table "The research activities of universities: the potential and strategies", Moscow, HSE, October 18, 2012:

Aleskerov F. (with Belousova V., Kiselgof S., Zin'kovsky K.) Universities in Russia: Efficiency and clusters.

35. Center for the Study of Rationality at the Hebrew University of Jerusalem, Israel, November 4, 2012:

Aleskerov F. Power in Organizations: Theory and Applications.

36. Murat Sertel Workshop on Advances in Economic Design, Paris, November 15, 2012:

Aleskerov F. Power in Groups: Theory and Applications.

ANNEX 4

DESCRIPTION OF MOBILITY

Table 1 “Incoming mobility”

who visited	dates of visits	which courses have been delivered	what are the results	what are the costs of the visits (rub.)
Prof. Hannu Vartiainen (Helsinki Center of Economic Research, University of Helsinki)	04.03.12 – 09.03.12	Lectures on «Modern models of the theory of the bargaining» (9 acad. hours)	Professional skill improvement, 27 participants	122 697
Prof. Shmuel Zamir (Center for the Study of Rationality, The Hebrew University)	23.03.12 - 05.04.12	Lectures on «The notions of strategy and equilibrium in strategic and extensive form games» and «Games with incomplete information» (29 acad. hours)	Professional skill improvement, 29 participants	346 843
Prof. Claude d'Aspremont (Center for Operations Research and Econometrics (CORE), Université Catholique de Louvain (UCL))	02.04.12 – 14.04.12	Lectures on «Mechanism Design» and «Games of incomplete information» (26 acad. hours)	Professional skill improvement, 37 participants	340 630
Prof. Eyal Winter, (Center for the Study of Rationality, Hebrew University of Jerusalem)	9.04.12 - 20.04.12	Lectures on «Incentive schemes in organizations with special emphasis on the role peer effects in designing optimal incentives» (40 acad. hours)	Professional skill improvement, 46 participants	408 086
Prof. R. Tyrrell Rockafellar (University of Washington and University of Florida)	22.06.12 - 02.07.12	Lectures on "Modern Models in Market Analysis" (32 acad. hours)	Professional skill improvement, 32 participants	292 711
Prof. Stan Uryasev (University of Florida and American Optimal Decisions)	22.06.12 - 02.07.12	Lectures on "Modern Models in Market Analysis"(24 acad. hours)	Professional skill improvement, 29 participants	250 018
Prof. Trevor Fenner (University of London)	09.12.12 - 13.12.12	Lectures on «Lifting algorithm and its applications» (8 acad. hours)	Professional skill improvement, 30 participants	54 927
Prof. Fred McMorris	05.12.12 –	Lectures on «The majority	Professional	70 946

(IIT, Chicago)	14.12.12	decision function on median semilattices» (12 acad. hours)	skill improvement, 32 participants	
Dr. Susana Nascimento (New University of Lisbon)	08.12.12 - 14.12.12	Lectures on «Proportional membership in fuzzy clustering and related methods» (10 acad. hours)	Professional skill improvement, 28 participants	56 261
Prof. Fred Roberts (Rutgers University, New Jersey)	08.12.12 - 14.12.12	Lectures on «Meaningless statements in landscape ecology and sustainable environments» (8 acad. hours)	Professional skill improvement, 30 participants	60 591
Total				2 003 710

Table 2 “Outgoing mobility”

Who	which research centers, conference	dates of visits	Results	what are the costs of the visits (rub.)
V. Podinovsky	IT + M&Ec`2012, Ukraine	25.05.12 – 04.06.12	Participation in the conference with report	20 397
S. Kiselgof	The 8th Spain-Italy-Netherlands Meeting on Game Theory, Hungary	15.07.12 – 19.07.1	Participation in the conference with report	71 780
V. Petruschenko	International Conference on Applied Operational Research, Thailand	25.07.12 – 27.07.12	Participation in the conference with report	24 540
R. Kamalova	Essex Summer School in Social Science Data Analysis, UK	05.08.12 – 18.08.12	Participation in the conference with report	67 051
D. Karabecyan	XI Meeting of Society for Social Choice and Welfare, India	15.08.12 – 22.08.12	Participation in the conference with report	74 975
A. Karpov	XI Meeting of Society for Social Choice and Welfare, India	15.08.12 – 22.08.12	Participation in the conference with report	75 708
Y. Veselova	XI Meeting of Society for Social Choice and Welfare, India	15.08.12 – 22.08.12	Participation in the conference with report	77 502
A. Belenky	5th International Public Procurement Conference (IPPC 5), USA	15.08.12 – 21.08.12	Participation in the conference with report	80 664
A. Lepskiy	“Intelligent Information Processing”, IIP-9, Montenegro	16.09.12 - 22.09.12	Participation in the conference with report	48 217
A. Lepskiy	6 th International Conference “Soft Methods in Probability and Statistics”, Germany	03.10.12 – 06.10.12	Participation in the conference with report	62 334
Total				603 168