Mathematical Methods in Economics 2005

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14 - 16 September 2005

Book of Abstracts

Czech Society for Operations Research

Czech Econometric Society

Faculty of Informatics and Management
University of Hradec Králové

CZECH SOCIETY FOR OPERATIONS RESEARCH
CZECH ECONOMETRIC SOCIETY
FACULTY OF INFORMATICS AND MANAGEMENT UNIVERSITY OF HRADEC KRÁLOVÉ

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Farkas´ Lemma and Linear Programming in Linearly Ordered Vector Spaces

David Bartl
University of Ostrava, Czech Republic

Abstract. We shall present a generalised version of Farkas' Lemma that is formulated within the framework of two vector spaces, one of them being linearly ordered, both being over a common linearly ordered field. We shall also present the corresponding version of Duality Theorem for linear programming. At last, we shall mention some other theorems of the alternative and related results.

An Aggregated Semi-Markov Decision Model for Traffic Control with Lane Restriction

Ondrej Bartl
University of Žilina, Slovakia

Abstract. Feedback control can be employed for solving traffic situations on a two-lane road with one lane closed in some sector. To obtain cost-effective control rules, a semi-Markov decision model with state or state-and-action aggregation is given.
This work was supported by Scientific Grant Agency of the Ministry of Education of Slovak Republic and the Slovak Academy of Sciences under grant No. 1/0498/03.

Multi-Criteria Evaluation of EU Regions

Danuše Bauerová, Jaroslav Ramík
Technical University of Ostrava, Czech Republic

Abstract. Based on our previous works we apply the concept of socio - economic potential (S-E-potential) of the regions to the NUTS3 regions in the Czech Republic and some EU countries. Using the real data and multi – criteria approach based on Analytic Hierarchy Process (AHP) and pair-wise comparisons our study identifies similarities and dissimilarities of the socio – economic development of the old EU countries and new ones.

Analyzing the Path of Slovakia towards Monetary Union by Means of a Multi-Equation Gap Model

Michal Benčík
National Bank of Slovakia, Bratislava, Slovakia

Abstract. After joining the European Union, Slovakia is preparing itself for the adoption of the euro. This process comprises bringing monetary policy and fiscal policy in line with the Maastricht criteria, while maintaining a low inflation rate and a stable nominal exchange rate during the two year preaccession membership in ERM II. In this paper, we study the possibility of a consistent scenario of transition from the current state to full compliance with these criteria, avoiding nominal depreciation and, if it exists, to determine conditions for such development. We build a multiequation structural gap model of transmission mechanism, incorporating the fiscal policy measure and long-run real appreciation due to Balassa-

Samuelson effect. Using this model we compute an illustrative baseline scenario and four alternative scenarios, exploring the comparative dynamics of the model. The main value added of this contribution is development of a tool for studying necessary conditions for consistent transition towards of Slovakia monetary union membership.

The Economics of Spam

Ladislav Beránek
University of South Bohemia, České Budějovice, Czech Republic

Abstract. In this paper model of economics of spam is established and analyzed from the social welfare perspective and from the recipient's view. The model is simplified because it assumes a network with one spammer, one email service provider and a number of recipients. The aim of this model will be the possibility of economic examination of various approaches to spam regulation and to verify the assumption that the spam can be both a positive externality as well as negative one.

The Stable Activities Problem and the Stable Multiple Activities Problem

Viera Borbelová
P. J. Šafárik University, Košice, Slovakia

Abstract. A stable matching problem is a pair (G,O), where G is a finite multigraph of an order n, and O is an n-touple of preference relations of vertices over the set of incident edges. The aim is to find matchings that satisfy some kind of stability. This problem has many interesting applications, for example National Resident Matching Program in USA, similar schemes in Canada and Scotland and the others. In our study we deal with two special stable matching problems - the stable activities problem and the stable multiple activities problem under three kinds of stability.

Commercial Spots Booking

Helena Brožová
Czech University of Agriculture in Prague, Czech Republic

Abstract. The problem of booking spots in the commercial breaks is a regular process task in TV programme construction. Each spot can be booked only one time per one break but number of breaks where it is booked depends on a contract. The final programme of commercial spots in breaks has to meet several conditions and criteria. However, this problem can be interpreted as an integer linear optimization model; we draw up a special method for it. The method is based on an approximation solution of distribution or transportation models.

Press Distribution Process with a Down-Up-Down Strategy

José M. Caridad y Ocerin[1], Francisco J. Rodríguez Aragón[2]
1) Centro Andaluz de Prospectiva, Cordoba, Spain, 2) GELESA, Madrid, Spain

Abstract. Press distribution is done trough a network of selling points and it has to be adjusted to match supply and a random demand in each of them. Conflicting goals arouse, as each point demand has to be forecasted, so in a particular outlet there could be an excess of supply or a bigger than the expected demand. The companies in charge of the distribution generally use heuristic methods, based on their market knowledge and of past experiences, in some cases, with neural networks or time series models. Global production is estimated and then it is assigned to the network nodes point. A strategy for the distribution process is established based on a Down- Up-Down procedure, and a measure to evaluate the assignment process related to the copany goals is proposed. This index is used to compare the annual evolution of sales and to determine the optimal ratio of the number of papers to be produced, related to the forecasted demand. A case study is presented related to a Spanish press distribution company.
GELESA company (www.Gelesa.es) has given support and data for this paper. Madrid. Spain.

Moment Problem and Worst-Case Value-at-Risk

Jana Čerbáková
Charles University, Prague, Czech Republic

Abstract. This paper deals with the problem of moments and its application to the calculation of the worst-case Value-at-Risk. To this purpose we exploit upper bounds for loss probability of univariate random variable with special properties, given expected value and variance. Subsequently, we suppose that except the first two moments of the distribution, we know further characteristics of the class of distributions. We assume symmetry and/or unimodality. The bounds are illustrated on the case of interbank exchange rate.
This work was supported by the Grant Agency of the Czech Republic (grant 201/05/H007).

Nonparametric Cointegration Analysis for Multivariate I(2) Processes and Application in Finance

Roy Cerqueti
University of Rome, Italy

Abstract. In this paper we focus on cointegration tests in a nonparametric framework. Our work follows Bierens' approach for processes I(1). The novelty is to provide an extension of such approach for processes I(2). The test statistics involved are obtained from the solution of a generalized eigenvalue problem, starting from two matrices that are independent on the data generating process. Our findings are obtained by introducing the k-th difference of the process, k = 1,..., d, in the matrices, and by imposing some asymptotic conditions on the model's parameters. Such strategy allows a set of distributional convergences results. Empirical results shows that the exchange rates or the inflation rate can be represent by integrated processes of order 2. Thus, we propose a test for the validity of the purchasing power parity (PPP) theory, over the period 1970 to 2002 for the Italian Lira, using the

econometric theory developed. PPP conditions are initially estimated in a nonlinear framework, finding evidence in favour of cointegration in the PPP condition.

Stochastic Dominance in the Choice of Optimal Ratios of the Non-Life Insurance Premiums

Bogdan Ciupek
University of Economics, Katowice, Poland

Abstract. The paper suggests a method of a decision support process while setting optimal combinations of insurance premium rates by non-life insurance companies. This method allows determining optimal combination of gross insurance premium rates for any amount of insurance forms. Such an optimal combination will constitute the base for setting more detailed insurance premium tariffs for particular kinds of insurance.

Real Options Analysis and Game Theory Application in Investment Process

Miroslav Čulík
Technical University of Ostrava, Czech Republic

Abstract. Real Option Approach represents appropriate valuation procedure when future uncertain states of the world can generate opportunities which were not expected and differ from those planned. Moreover, in combination with Game Theory, can help frame investment problems and anticipate competitor's reactions in order to improve their own decisions. First, Real Option Analysis and Game Theory principles are described. Illustration part of the paper states valuation example when both approaches are employed.
This paper is supported by the Grant Agency of the Czech Republic (GAČR): 402/04/1357.

Money's Function in the Czech Monetary Business Cycle

Stanislav David, Osvald Vašíček
Masaryk University in Brno, Czech Republic

Abstract. Analysts have devoted considerable time and effort towards developing new and improved models for monetary policy evaluation. These newly developed models differ considerably in details. Do these existing models provide an accurate and complete description of money´s role in the monetary business cycle? That is the question addressed here. The paper begins by constructing small New Keynesian DSGE model. It goes on to estimate the model with quarterly timeseries data of the Czech economy. Maximum likelihood estimates of the model's parameters suggest that money plays a nonessential role in the Czech monetary business cycle. The Kalman filter was used to evaluate negative log likelihood function of the model.
This paper has been worked as a part of research activities at the grant project of GA CR No. 402/05/2172.

Estimating Priorities in AHP with Interval Pair-Wise Judgements

Dimitris K. Despotis, Dimitris Derpanis
University of Piraeus, Greece

Abstract. In this paper we deal with the problem of priority elicitation in the analytic hierarchy process (AHP) on the basis of approximate pair-wise comparison judgements. We propose a min-max goal programming formulation to derive priorities in the case that the preference judgements are provided as interval numbers. By applying variable transformations we develop a linear programming model that is capable of deriving priorities from both consistent and inconsistent interval judgements. The proposed method is illustrated by numerical examples.

Application of Data Envelopment Analysis for Efficiency Evaluation in the Health Services

Martin Dlouhý, Lenka Flusserová
University of Economics, Prague, Czech Republic

Abstract. Data Envelopment Analysis (DEA) is a method of efficiency evaluation of production units. The strengths of DEA are: (1) the method is able to deal with multiple inputs and outputs; (2) for technically inefficient unit DEA identifies the peers that are real production units, (3) software for DEA is now available, which makes it is easy to carry out all calculations and present results. The main weaknesses of DEA are: (1) a deterministic nature of method. Because DEA does not include an error term in the model, there is possibility of a measurement error; (2) hypothesis testing is much less developed in DEA in a comparison to econometric analysis. DEA proved to be a very attractive method of efficiency evaluation for health economists throughout the world. DEA is now mentioned in the textbooks of health economics. There is no doubt that the number of applications in the health services will be growing.
The work was supported by project no. 402/03/1360 "Models of multiple criteria decision making and data envelopment analysis as support tools for economic decisions", funded by the Grant Agency of the Czech Republic

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An Application of Quasi-Hierarchy Approach to Decision Making Under Uncertainty

Cezary Dominiak
University of Economics, Katowice, Poland

Abstract. Scenario planning is very popular and useful technique for decision aiding under uncertainty. The decision analysis problem became complex when it is necessary to take into consideration more than one criterion. In this paper the multicriteria decision aiding procedure under uncertainty is proposed. Our proposal may be used in such cases when decision maker can give information about his preferences in the way of hierarchy of goals with tolerance limits. The proposed procedure is illustrated by simple numerical example of strategic decision-making problem in the food processing enterprise.

Properties of the S-shape Value Function and its Applications

Renata Dudzińska, Donata Kopańska-Bródka
University of Economics in Katowice, Poland

Abstract. In decision making an attitude toward risk of the decision maker is very important. In decision theory some attitudes are distinguished: risk aversion, risk seeking and risk neutral, but the research of the decision makers' behaviors indicates that the attitude toward risk is changeable. Many people can be both risk averters and risk seekers, depending on the range of monetary values being considered and an individual's attitudes can vary over time. The value functions for such decision makers' are the s-shape curves. Properties of the s-shaped value functions differ from the concave-shaped function. According to Prospect Theory, the value function by which investors make investment decision is an s-shaped function depending on his preference and his wealth. In the paper we will show some properties of the s-shape value function and its application in investment decisions.

Uncertainties in Stochastic Programming

Jitka Dupačová
Charles University, Prague, Czech Republic

Abstract. In stochastic programming, uncertain values of coefficients are modelled as random and complete knowledge of their probability distribution is assumed. Using ad hoc distributions may lead to bad, costly decisions. It pays to include the existing limited information into the model, cf. the minimax approach - the main subject of this presentation. It applies to cases when the probability distribution is only known to belong to a specified class of probability distributions and one wishes to hedge against the least favourable distribution. By choosing a suitable class of distributions, further level of uncertainty is introduced and treated via stability analysis.

Microeconomic Analysis of Equilibrium in Network Industries in Context of Influence of Regulated Prices

Eleonora Fendeková, Michal Fendek
University of Economics, Bratislava, Slovakia

Abstract. The aim of the paper is to examine the equilibrium conditions in the market of network industries. With regard to analysis of equilibrium in network industries models it is important to point out that except for competition policy protection the state fulfils another specific task – regulation of network industries. The state influences proportional relations between price and
supply of network industry production. The conditions for equilibrium of network industries and methods of their regulations will be examined in the paper. The stress will be laid on the regulation on the base of returns – Rate of Return Regulation (ROR). Attention will be paid to the ways of calculation reasonable profit in regulated industries.

Estimating Technical Efficiency of Human Cupital Production in the Italian University with Correction for Student Characteristics: the Case of Florence University

Guido Ferrari[1] and Tiziana Laureti[2]
1) Università di Firenze, Italy, 2) Università della Tuscia, Italy

Abstract. The aim of this paper is to estimate the technical efficiency of human capital formation in the Italian University by using a stochastic frontier model in which both random terms are heteroscedastic. Using individual level data, we allow the variance of the single parameter half normal distribution to be a function of a set of explanatory variables related to student specific characteristics in order to incorporate exogenous influence on efficiency. Moreover, since the mix of resources and the internal organization varies from faculty to faculty, we incorporate heteroscedasticity in the two sided error term. The application of the methodology to the Florence University graduates revealed that technical efficiency measures are extremely sensitive to the proposed correction for heteroscedasticity.

Modeling of Combinatorial Auctions in Network Economy

Petr Fiala, Lenka Flusserová
University of Economics, Prague, Czech Republic

Abstract. The network economy is a term for today's global relationship among economic subjects characterized by massive connectivity. Today network systems provide the infrastructure and foundation for the functioning of societies and economies. They come in many forms and include physical networks such as transportation and logistical networks, communication networks, energy networks, as well as more abstract networks as economic, financial, social, and knowledge networks. The paper presents modeling of auctions in network economy. Auctions are important market mechanisms for the allocation of goods and services. Combinatorial auctions are those auctions in which bidders can place bids on combinations of items. Combinatorial auction is an appropriate instrument for selling network capacity. The winner determination problem in a combinatorial auction for selling network capacity is formulated. Efficient algorithms for multicommodity network problems can be used.
The research project was supported by Grant No. 402/05/0148 from the Grant Agency of Czech Republic „Network economy – modeling and analysis."

Modeling of Interacting Agents in Network Economy

Petr Fiala, Václav Kořenář
University of Economics, Prague, Czech Republic

Abstract. The paper presents models for analyzing network economy. There is possibility to analyze behavior of the network by aggregating production units. Modeling of micro units in a stochastic and dynamic framework uses Markov processes to model interacting micro units. Specifications of decision processes for micro units determine stochastic mechanisms for the units to change their decision over time. The approach can be used for network models as

aggregation of micro units and for determination how uncertainty in the model affects macro behavior. Using simulation we are able to find out how each unit of the network can influence the others, their decisions and behavior.
The research project was supported by Grant No. 402/05/0148 from the Grant Agency of Czech Republic „Network economy – modeling and analysis“.

Estimation of Binary Choice Model with Panel Data

Zuzana Fíglová
University of Economics, Prague, Czech Republic

Abstract. The aim of this paper is to estimate the binary choice model with panel data. Binary choice model is based on random utility theory of consumer behavior where each consumer maximizes his utility through the consumption of goods and services. Panel data represents data where multiple cases were observed at two or more time periods. The model was applied to data from the Household Budget Surveys 2000-2003 in order to analyze choice behavior of households. We analyzed the role of income as a determinant of ownership of PC and its change through the observed period of time.

Multiple Relations of Composite Commodities

Jiří Frank, Martin Gavalec
University of Hradec Králové, Czech Republic

Abstract. Applications of composite-commodity theorem to a multiple relation is studied. Two tradable inputs are related in the complementarity form and, at the same time, each of these inputs is related in the input-output form to a common final product. Possible effects of the described multiple relations, in comparison to dually related goods are examined on the basis of relevant simultaneous equations.
This work was partly supported by Czech Science Foundation, # 402/04/0642

Applications of Gini's Mean Difference to Portfolio Analysis

Agata Gluzicka and Donata Kopańska - Bródka
University of Economics in Katowice, Poland

Abstract. Gini's mean difference is a measure of dispersion defined as expected absolute pairwise difference of all variates within a distribution. The Gini mean difference is a popular measure of the income inequality in the economics literature. According to Markowitz, investors make investment decisions employed variance is a measure of risk (meanvariance model), but Yitzhaki presents models in which risk is measured by Gini's mean difference (mean – Gini model). This paper is a review across different definitions of Gini's mean differences and extended Gini's index. The autors will show more significant properties of this coefficient. The Gini's mean will be applied to construct optimal portfolios for companies listed on Warsaw Stock Exchange.

The Knowledge Granules of Multicriteria European Countries Classification Problem

Iwona Gruszka
The Karol Adamiecki University of Economics, Katowice, Poland

Abstract. Presently, in the age of the process of European Union enlargement, one of the most important problem is to answer the questions about the classification of EU members by the economic characteristics into the groups according to The World Bank Organization. The aim of this work is to extract the knowledge granules of multicriteria European countries classification problem.

Necessary Conditions for Condorcet Winner Configurations in Facility Location Games

Jana Hajduková
P. J. Šafárik University, Košice, Slovakia

Abstract. We consider a problem of locating a fixed number of facilities along a line to serve n players. We model this problem as a cooperative game and assume that any vocational configuration can be eventually disrupted through the majority of players voting for an alternative configuration. A natural solution to such a problem is a configuration that is a Condorcet winner (CW, for short). In our paper we state a number of necessary conditions for a configuration to be CW. Consequently, we illustrate that the proven propositions enable to efficiently verify whether a given configuration is CW, and to efficiently find a CW configuration, if one exists.

Power Indices in Voting by Count and Account

Midori Hirokawa[1] and Milan Vlach[2]
1) Hosei University, Tokyo, Japan
2) The Kyoto College of Graduate Studies for Informatics, Kyoto, Japan

Abstract. We consider a game that reflects both simple majority voting (voting by count) and weighted majority voting (voting by account). Such a compound game has a long history and recently found application in decision-making procedures used in some stockholders' meetings and in conducting rehabilitation procedures in financially troubled companies. We show that the typical power indices have the following property: the difference in the compound game between the power index of a voter with greater weight and the power index of a voter with lower weight is not exceeding the analogous difference in the corresponding weighted majority game.

Quantitative Analysis of Economy Model using Method of Moments

Miroslav Hloušek
Masaryk University in Brno, Czech Republic

Abstract. This paper deals with calibration of economy model usány method of moments. Real data of United States are used. The time series are decomposed into the trend and the

cycle component using Hodrick-Prescott filter. Estimation of the historical standard deviations and autocorrelations is made. The model equations are converted into reduced form of VAR model. The properties of the model in terms of moments are computed. The parameters are properly set to replicate the moments in data. The results is demonstrated on behavior of the model using impulse responses.
The paper has been prepared as a part of research activities under project of GA CR No.402/05/2172.

Estimation in Chance-Constrained Problem

Michal Houda
Academy of Science of the Czech Republic, Prague

Abstract. Many engineering and economic applications make use of the stochastic programming theory. Major part of models require a complete knowledge of distribution of random parameters, but this assumption is rarely accomplished. We then need to study behavior of optimal solutions when the distribution changes slightly. In our contribution we consider the chance constrained problem; we recapitulate some known theoretical results about stability and estimation of the problem. We concentrate especially on results from stochastic and robust programming; we try to outline a link between empirical and robust estimates of chance-constrained problem.
This research is supported by the projects registered under No. 402/03/H057, No. 402/04/1294, and No. 402/05/0115 by the Grant Agency of the Czech Republic.

Sensitivity Analysis in Piecewise Linear Programming Models

Milan Houška, Martina Beránková
Czech University of Agriculture Prague, Czech Republic

Abstract. A piecewise linear programming (PLP) model is usually solved by transformation to a linear programming (LP) model. In the case of convex optimization model the standard simplex method can be used for obtaining results. Stability of solution and sensitivity on changes of initial parameters cannot be tested by the standard method. It does not respect some implicit relationships between variables, which arise from the transformation of PLP model to LP model. The article suggests alternative sensitivity analysis, which respects these relationships. It describes a method for sub-optimal solutions finging and RHS constants components sensitivity analysis. Principles of the suggested method can be also used for cost coefficients sensitivity analysis.

Modelling the Equilibrium on External Market Case of Slovakia

Jaroslav Husár
University of Economics, Bratislava, Slovakia

Abstract. The Slovak economy suffers from serious problems in the field of export and import, international trade. So today's research agenda is highly oriented on this problem.

There are noteworthy differences in the effectiveness of the foreign sector performance between Slovakia and many developed countries. To get satisfactory economic performance, we see as one of the important problem to use tools that will help to create the strategy for the phenomenon captured under the popular heading globalisation. Empirical techniques based on model are the field that has become the interest of our research. The paper will present the model based on the principles of Mundell-Fleming. We maintain that one of the principles might be the problem of reaching the equilibrium in foreign sector. But what determines the equilibrium. The paper goal is to get the answer.

Some Problems of VAR Models of the Monetary Transmission Mechanism

Roman Hušek
University of Economics, Prague, Czech Republic

Abstract. The prospect of adopting euro currency in the new EU member states has boosted a number of studies focusing on estimation, functioning and comparison of monetary transmission mechanism in an international environment. Such analysis is often based on the theory of optimum currency area by Mundell (1961) and usually uses macroeconomic vector autoregression models (VAR). Generally, VAR methodology is focused on autonomous shocks, and their pattern of influencing the system is described by the impulse response functions and variance decomposition. In this paper, we discuss the possibilities encompassed in the VAR approach and at the same time we stress its known barriers. This task if of considerable importance, as various barriers (limitations) of the VAR approach are often ignored in many studies, which frequently leads researchers into inaccurate and often completely incorrect results and conclusions.
This paper is a part of the research project of the Grant Agency of the Czech Republic No. 402/03/1299.

Extremes of Stochastic Processes

Jana Husová
University of South Bohemia, České Budějovice, Czech Republic

Abstract. Many economic problems are studied as stochastic processes. It may be important to know the behavior of their extremes values. In the paper a weakly convergent sequence of stochastic processes is supposed. A weak convergence of processes, which are obtained as extremes from original processes, is studied. Characteristics of index collections of such processes are established.

New Criteria for Stochastic DEA

Petr Chovanec
Charles University, Prague, Czech Republic

Abstract. By its nature, Data Envelope Analysis (DEA) leaves no room for uncertainty in data such as measurement errors. To improve this fact, we consider α-stochastic efficiency concept,

and we relate this problem to the stochastic programming problem. Probability inequalities are employed for introducing new criteria, and two special cases for normal and for general distribution are discussed. The strengths of new criteria are illustrated with a numerical example.
This work was supported by the Grant Agency of the Czech Republic under grants 402/03/H057, 402/04/1294 and 402/05/0115.

Exchange Rate and Monetary Policy in Slovak Economy

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University of Economics, Bratislava, Slovakia

Abstract. During the last four years the Slovak crown has surprisingly appreciated against the Euro (11.8 %). On the basis of analytical approaches like the international parities conditions it is possible to say, that these conditions don't hold. The current inflow of the capital to the Slovak economy influences strongly the balance of payments and the Slovak currency is being appreciated. Exchange rate policy of the National bank of Slovakia through interventions influences the development of the Slovak crown only for a very short period. Our presentation is focused on the analysis of the exchange rate market using the idea of the Mundell-Fleming model which was modified for the Slovak economy for the years 1999-2004.

A MS Excel Based Support System for Data Envelopment Analysis Models

Josef Jablonský
University of Economics, Prague, Czech Republic

Abstract. Data envelopment analysis (DEA) is a tool for evaluation of efficiency and performance of decision making units. DEA models are based on the definition of efficiency as the ratio of the sum of outputs produced by the unit divided by the sum of inputs spent in the production process. The standard data envelopment analysis models split the units into inefficient and efficient ones without further possibility to classify the efficient units. Super-efficiency DEA models are the extension of the standard DEA models that make it possible to classify the efficient units. The paper informs about an original add-in MS Excel application that offers a simple tool for solving basic DEA models including super-efficiency models.
The research is supported by the Grant Agency of Czech Republic – grant no. 402/03/1360.

Quantile Regression: An Application to the Wages in the Czech Republic

Jana Kalčevová
University of Economics, Prague, Czech Republic

Abstract. The analysis of wages is focused on the dependency of wages on various factors. For that analysis we usually use wage regression and assume the relationship between logarithm of wages and schooling or experiences. In the work with a large data file the problem occurs – we detect heteroscedasticity often. The estimations of regression coefficients by OLS are unbiased and consistent however they are inefficient. Therefore we use the other

methods which assume heteroscedasticity. One of them could be robust regression, the other one could be quantile regression. In this paper quantile regression is introduced and an application on wages in ČR is presented.

On Stability of Stochastic Programming Problems with Linear Recourse

Vlasta Kaňková
The Academy of Sciences of the Czech Republic, Prague

Abstract. Analyzing (generally nonlinear) stochastic programming problems with recourse we can see that this type of the problems is a composition of two (inner and outer) optimization problems. A solution of the outer problem depends on the "underlying" probability measure while a solution of the inner problem depends on the solution of the outer problem and on the random element realization. Consequently (in the case of the optimal solution of the outer problem) the optimal value and the solution set of the inner problem depend also on the "underlying" probability measure. The aim of the contribution is to investigate this dependence.
This research was supported by the grant agency of the Czech Republic under Grants 402/04/1294, 402/05/0115 and the Grant Agency of AS CR under Grant A 7075202.

An Application of a Generalized Multiple Linear Regression Model

Ivan Kavkler, Alenka Kavkler
Faculty of Economics and Business, University of Maribor, Slovenia

Abstract. The paper discusses an application of a generalized multiple linear regression (GMLR) model by using factor analysis. The explanatory variables are often correlated, which prevents the use of classical multiple linear regression. By using factor analysis this problem is avoided because the explanatory variables are replaced with a smaller number of uncorrelated common factors. GMLR is demonstrated on a case of the Minesweeper computer game. The authors created a random sample by actually playing the game and achieved a satisfactory approximation of a normal distribution. The results are discussed in view of the consequences for the strategy of a player.

Optimal Range for the iid Test Based on Integration across the Correlation Integral

Evžen Kočenda, Ľuboš Briatka
CERGE-EI, Charles University and Academy of Sciences of the Czech Republic, Prague

Abstract. This paper builds on Kočenda (2001) and extends it in three ways. First, new intervals of the proximity parameter ε (over which the correlation integral is calculated) are specified. For these ε-ranges new critical values for various lengths of the data sets are introduced and through Monte Carlo studies it is shown that within new ε-ranges the test is even more powerful than within the original ε-range. The range that maximizes the power of the test is suggested as the optimal range. Second, an extensive comparison with existing results of the controlled competition of Barnett et al. (1997) as well as broad power tests on

various nonlinear and chaotic data is provided. Test performance with real (exchange rate) data is provided as well. The results of the comparison strongly favor our robust procedure and confirm the ability of the test in finding nonlinear dependencies as well its function as a specification test. Finally, new user-friendly and fast software is introduced.

Stability and Lyapunov Exponents in Keynesian and Classical Macroeconomic Models

Jan Kodera, Karel Sladký, Miloslav Vošvrda
Academy of Sciences of the Czech Republic, Prague

Abstract. In this article we compare dynamical properties of Keynesian and Classical macroeconomic models. We start with an extended dynamical IS-LM neoclassical model generating behavior of the real product, interest rate, expected inflation and the price level over time. Limiting behavior, stability, and existence of limit cycles and other specific features of these models will be compared.

Stochastic Dominance and CVaR in Portfolio Selection Problem

Miloš Kopa
Charles University, Prague, Czech Republic

Abstract. This paper describes second-order stochastic dominance rules concerning portfolio selection problem. We consider discrete probabilistic distributions of returns of the assets using the scenario approach. As was shown in [4], the conditional value-at-risk corresponds to second-order stochastic dominance. Using this property, the necessary and sufficient condition for a non-dominated portfolio relative to all possible portfolios created from a set of assets is derived.
This work was supported by the Grant Agency of the Czech Republic (grant 201/05/H007)

Tree Approach to the Time Bounded Transportation Problem

Petr Kučera
Czech University of Agriculture in Prague, Czech Republic

Abstract. The time bounded transportation problem (TBTP) is related to the vehicle routing problem (VRP). The main difference is that the routes are paths (not cycles), i.e. vehicles do not return to the central city. Costs are given for straight routes between each pair of cities and represent time necessary for going through. Each path must not exceed a given time limit. The sum of time for all routes is to be minimized. The method suggested here is based on combining approaches of the Mayer method for the VRP and the Christofides method for the traveling salesman problem (TSP). The Mayer method, choosing cities for single routes, properly constructs a spanning tree for all cities on each route and these trees can be utilized in the first step of the Christofides method. In addition, the Christofides method achieves the best approximation ratio among all methods for the TSP. This method is tested on several instances and compared with the saving method, which is considered to be one of the best methods for the TBTP.

Long Memory in Volatility or Parameter Inconstancy? The Case of Prague Stock Exchange

Alexandr Kuchynka
University of West Bohemia in Pilsen, Czech Republic

Abstract. The paper summarizes some stylized facts in financial returns, in particular so called long-range dependence and IGARCH effect. The long range dependence demonstrates itself by a very slow decay of the sample autocorrelation function of absolute and squared returns, especially at larger lags. However, it has been argued elsewhere that these effects can be explained by nonstationarity due to shifts in unconditional variance. One possibility how changes of unconditional variance in GARCH model can occur is to allow for time-varying parameters. In this paper, we verify whether the above mentioned stylized facts can be observed in Prague stock index PX 50 and we perform the test of parameter constancy of the estimated GARCH model.

Modification of the EOQ Model for the Annual Constant Demand Situation and the Possibility of its Usage in a Supply Chain

Martina Kuncová
University of Economics, Prague, Czech Republic

Abstract. Supply chain management is the latest concept in the attempt to optimize the entire process of manufacturing the product, right down to the point of its consumption, and all the stages inbetween. Inventory is an important supply chain driver because changing inventory policies can dramatically alter the supply chain's efficiency and responsiveness. The basic EOQ model and formula has been created to solve the problem of the optimal order quantity via the inventory cost minimization. Demand is expected to be fixed and for the model it is necessary to know the inventory ordering and holding cost. Because of the fact that the annual fixed demand may or may not be fixed for the shorter period (month, week, working day) and the curves of the fixed and variable inventory cost need not be smooth (depending on the order quantity), the new model, playing upon the EOQ model and its presumptions, is presented. Owing to the complexity of the new model, the procedure of using the MS Excel software for obtaining the best solution is demonstrated as well as the possibility of using this model in a small supply chain.
This paper was supported by Grant No. 402/05/0148 from the Grant Agency of the Czech Republic.

Estimation and Estimator Consistency

Petr Lachout
Charles University in Prague, Czech Republic

Abstract. Many problems considered and investigated in econometrics follow a general schema. We possess data generated by a model containing randomness and determined via a collection of parameters. We are interested in future behavior of the observed system. Therefore, a convenient estimation procedure for unknown parameters becomes the crucial

task. This schedule often leads to derivation of an optimisation problem that solution is a reasonable estimator of required parameters. We will discuss behavior of such an estimator. Especially, we consider and explain notions as ¨True Model¨, ¨True Parameter¨ and ¨Estimator Consistency¨. The problem will be illustrated on a linear regression model.

Some Notes to Black-Scholes Equation

Ladislav Lukáš
University of West Bohemia, Pilsen, Czech Republic

Abstract. Paper concerns with well-known fair-pricing model of European options described by Black-Scholes equation. The notes discuss various links between diffusion model and B-S pricing model in order to broaden understanding of the B-S equation and its solution.

An Efficient Procedure for 0-1 IP Problem

Otakar Machač and Simona Böhmová
University of Pardubice, Czech Republic

Abstract. The paper describes an effective procedure of solving so called "Capital Budgeting Problem", with use of spreadsheet tables. The first step of the method consists of the problem formulation and a preoptimality analysis. Next, the algorithm procedure using Microsoft Excel is suggested. This procedure is based on a quick elimination of infeasible combinations and on a reduction of feasible combinations which cannot be the optimal solution. The remaining feasible combinations are analysed in a specifically prepared table finding the optimal solution effectively. Comparison of the suggested procedure with heuristic and exact (using Solver tool in Excel) methods is shown on a numerical example and the advantages of the procedure are discussed.

Fuzzy Time Series Modelling by SCL Learning

Dušan Marček[1, 2], Milan Marček[3]
1) Silesian University Opava, Czech Republic
2) University of Žilina, Slovakia
3) Kiwa, Slovakia

Abstract. Based on the works [11], [22] a fuzzy time series model is proposed and applied to predict chaotic financial process. The general methodological framework of classical and fuzzy modelling of economic time series is considered. A complete fuzzy time series modeling approach is proposed. To generate fuzzy rules from data, the neural network with Supervised Competitive Learning (SCL)-based product-space clustering is used.
This work on this contribution was supported by the grants GAČR 402/05/2786 and VEGA 1/2628/05.

A Model of Stock Prices Behavior

Jan Melecký
Silesian University in Opava, Czech Republic

Abstract. The considered model describes dynamics of intrinsic value and actual stock price in stock markets. The model construction is based on characterization market participants' behavior and on relationships between stock market and economical environment. Our model respect different behavior of the market participants in the undervalued and overvalued market. It is shown how the fundamentalist and chartist patterns of the market participants' behavior can affect the price dynamics. The model is represented by the system of differential equations with time delay. Our aim is to investigate processes which influence the price dynamics in stock markets.

Core Equivalence for Economy on Belief

Takashi Matsuhisa
Ibaraki National College of Technology, Ibaraki, Japan

Abstract. We investigate a pure exchange economy under uncertainty with emphasis on the multi-modal logical point of view; the traders are assumed to have a multi-modal logic of belief. We propose a generalized notion of expectations equilibrium for the economy, and we establish the extended core equivalence theorem: The ex-post core for the economy coincides with the set of all its expectations equilibria in belief.

A Comparison of Two Parametric ROC Curves Estimators in Binormal Model

Jaroslav Michálek[1], Marek Sedlačík[2], Lucie Doudová[3]
1,3) Masaryk University in Brno, 2) University of Defence in Brno, Czech Republic

Abstract. The receiver operating characteristic curve ROC(t) plays an important role in many economic branches when it is necessary to classify between two populations. There are several approaches how to estimate it: classical estimator based on the empirical cumulative distributive function, the weighted regression estimator, the estimator based on the best unbiased cdf estimator, non-parametric approaches based on the kernels or bootstrapping. In the contribution the binormal model will be considered and the attention will be concentrated on the comparison of two parametric methods. The first one is the method of reweighted least squares where weights depend on the response variable. The second one is based on the best unbiased cdf estimator. The comparison of both methods will be demonstrated by simulations and the performance of both methods will be discussed for small sample sizes.
Supported by GA ·CR under the Grant No. 402/04/1308.

Analysis of Style Investing and Evaluating Style Analysis of the Mutual Funds

Zdenka Milánová
Comenius University Bratislava, Slovakia

Abstract. We try to study prices of assets, because some investors classify risky assets into different styles and move funds between these styles depending on their relative performance. We assume that news about one style can affect the prices of other apparently unrelated style, that assets in the same style commove to much while assets in different styles commove too little and high average returns on a style will be associated with common factors for reason unrelated to risk. In the last part we try to apply these conclusions on Slovak financial market.

Methodology of Creation a Social Accounting Matrix in Slovakia

Veronika Miťková
Comenius University Bratislava, Slovakia

Abstract. A function of national accounts is providing a picture of economic activity of a society. National accounts are based on economic behavior of individuals. Since transactions between sectors are monitored two times in accounting, for each sector separately, it is possible to create a Social Accounting Matrix. A Social Accounting matrix presents in one unified set of accounts a picture of the "circular flow" of a market economy. The Social Accounting Matrix provides a consistent picture of the flow-of-funds accounts of the separate institutions or "actors" in the economy.

Alternative Portfolio Selection Models

Vladimír Mlynarovič
Comenius University Bratislava, Slovakia

Abstract. The paper treats alternative portfolio selection models as an extension to the model in the mean – variance space. The basic motivation follows from the facts that recent statistical studies revealed that not all assets follow normal distribution and portfolio management using lower partial risk measures is attracting more attention of practitioners. At the first part of the paper such lower partial risk measures as lower semi – variance (lower semi – standard deviation), lower semi – absolute deviation, below target risk and conditional value at risk are presented. In the second part of the paper portfolio selection models based on these risk measures are formulated.

Securing of Business Information

Jaroslav Mlýnek
Technical University of Liberec, Czech Republic

Abstract. Information of every successful business company belongs to its most important assets. Companies have to protect their information due to their own interests and legal

regulations. This article describes the methodology of information evaluation for the purpose of information securing from confidentiality, integrity and availability points of view. The information evaluation is an essential step to ensure the adequate securing of information. The information evaluation is based on the principle of the worst possible scenario estimation that can be expected in a company, in case of information disclosure, modification or unavailability.

Tests of Heteroskedasticity and Eventual Conflicts among Them

Dalibor Moravanský, Daniel Němec
Masaryk University Brno, Czech Republic

Abstract. The contribution presents the results of the authors' recent experience with the use of some tests of heteroskedasticity. First application refers to the investigations of the variability of university teachers' wages, while the second is the simulation study bringing knowledge of how often and how much the results of tests may differ when applied to samples of the different sizes. Some comments on properties of these tests relating to problems solved, which were met during applications are also amended.

The Quantitative Analysis of Ostrava Region Water Supply Development

Lubomír Müller
University of Ostrava, Czech Republic

Abstract. One of the water service impositions is to predicate water requirement in given region. This problem gains importance especially in connection with long-term investments like pattern reconstruction. This article analyzes water requirement in the pilot region Ostrava and it tests predict ability of some models for water requirement development assessment at the same time. The centre of this paper is quantitative and qualitative analysis during the period 1980 – 1998 and its prediction. This problem express itself practically in all over the world in such measure, that water problems transcend the state borders and it becomes global problem. As however minimal water quantity is inevitable for society life on given development degree, it's very important for further capital intentions to try to forecast consumption advancement.

Multifactoral Analysis of the Traffic Potential of the Region

Marie Müllerová, Lubomír Müller
University of Ostrava, Czech Republic

Abstract. The Traffic Regional Potential and its Development is actual and very difficult and important problem of the modern economy. This paper focused on the description of the Regional Traffic Potential and its comparative position among other Regions in Czech Republic with help of the Multifactoral Analysis.

On Regular and Parametric Data Envelopment Analysis

Luka Neralic[1], O. Stein[2]
1) University of Zagreb, Croatia, 2) Aachen University, Germany

Abstract. We give a generic regularity condition under which each weakly efficient Decision Making Unit (DMU) in the Charnes-Cooper- Rhodes (CCR) model of Data Envelopment Analysis (DEA) is also CCR-efficient. Then we interpret the problem of finding maximal parameters which preserve efficiency of CCR-efficient DMUs under directional perturbations as a general semi-infinite optimization problem and use a recently suggested numerical method for this problem class to calculate maximal directionally efficient DMUs. As a practical example we investigate the efficiency of Croatian banks under additive perturbations.

Czech Machinery in the Light of Tobin's Q

Václava Pánková
University of Economics, Prague, Czech Republic

Abstract. Investment expenditure relates to the optimization problem: to create an optimal capital stock as a function of expected profits. According to the Q-theory, investment depends on the ratio of the market value of business capital assets to their replacement value known as Tobin´s Q. The Q is not observable but can be computed both on macroeconomic and microeconomic level. Macroeconomic Q is derived from the Keynes price level equation as a measure of the economy´s willing to invest. Expected value necessary for computing Q of a firm, even if not quoted on stock markets, uses a forecast from VAR model with panel data. Czech machinery is analyzed.
Financial support of GACR 402/04/0756 is gratefully acknowledged by the author

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Scheduling Serial - Parallel Processors – A Case Study

Jan Pelikán
University of Economics, Prague, Czech Republic

Abstract. Methods of Operations Research can play an important role in the process of increasing production productivity and decreasing production costs. We show in this case study how discrete optimization models can be used to find the optimal ordering production batches on lathes. The aim of the optimization is to suggest a processing order of production batches, which is connected with the minimum total processing time of the corresponding production order. For solving the problem, an original mathematical model including discrete variables is proposed. The model is solved by using of the system LINGO 8.0. Obtained results are very interesting since they lead to a significant decrease of the total processing time in comparison with the present practice.

Split Delivery Problem

Jan Pelikán, Jan Fábry, Václav Kořenář
University of Economics, Prague, Czech Republic

Abstract. Delivery problem is a modification of the traveling salesman problem. It consists in the optimization of routes in a communication network, where all routes must start in one depot and each location must be visited. Demand for commodity is defined for each customer and total demand of all customers is greater than the capacity of the vehicle used for distribution. Each of the routes must be designed not to exceed the capacity of the vehicle. The objective is to minimize the total lengths of all routes. If demand of each customer is less than the capacity of the vehicle, delivery can be realized at once and it is possible to apply mathematical formulation analogous to the model of traveling salesman problem with two-indices variables. Otherwise it seems to be useful to split a delivery into several routes. In such situation the model with three-indices variables must be used what significantly increases a number of variables and decreases the real opportunity to find the optimum in reasonable time. The paper describes both approaches and shows the difference between them on the numerical example.
This publication was supported by the Grant agency CR under project 402/03/1283.

Differential Equations in Health Insurance Disability Risk Models

František Peller, Lea Škrovánková
University of Economics, Bratislava, Slovakia

Abstract. A basic probabilistic multistage structure is defined, which provides the possibility of a systematic modelling for Health insurances (disability annuities and lump sum). A timecontinuous general model is proposed, which allows us to take into consideration a wide range of different policy conditions.

Traveling Salesman Problem using SOS Subtours Elimination Constraints

Štefan Peško
Univesity of Žilina, Slovakia

Abstract: The possibility of using special ordered sets (SOS) of type 1 and 2 for solving the TSP is considered. We study new heuristic based on the solution of the linear assignment problems with iterative added SOS subtours elimination constraints. We prove that this mathematical programming model doesn't have fractional solutions. When we use SOS1 constraints and salesman tour is the solution then we have an optimal solution. If we must use SOS2 constraint then the resultant salesman tour can be heuristical. The computational experience with some TSPLIB instances via LPSolver is presented. We indicate direction for further research.

On an Optimal Advertising Model with Lagged Effect of Advertising

Pavel Pražák
University of Hradec Králové, Czech Republic

Abstract. This paper deals with a modification of the Vidale-Wolfe advertising model. The model is enriched by an assumption that the current intensity of sales depends mainly on the past intensity of advertising. Mathematical formulation results in a system of two ordinary differential equations. First we study special case when the intensity of advertising is constant. Then we concentrate on finding an optimal strategy of advertising with regard to a given cost function. For this purpose we use the Pontryagin maximum principle.

Application of the Bootstrap Filter Method on a Small Economy Model

Hana Pytelová, Osvald Vašíček
Masaryk University, Brno, Czech Republic

Abstract. The paper shows the monetary policy problem in a simple framework and it illustrates the behavior of the model on the Czech economy data. Model parameters are estimated by the weighted Bootstrap algorithm which represents an important alternative approach to model estimation. Its power lies in its generality because it is usable for non-local systems. It is especially important in the case that classical methods like extended Kalman filter diverge or are not applicable; or when only the lack of data is available (which is the case of the Czech Republic). Conditional probability density functions of the parameters and states are analyzed.
This paper has been worked as a part of research activities at the grant project of GA CR No. 402/05/2172.

Duality in Fuzzy Multiple Objective Linear Programming with Possibility and Necessity Relations

Jaroslav Ramík
Silesian University in Opava, Czech Republic

Abstract. A class of fuzzy multiple objective linear programming (FMOLP) problems with fuzzy coefficients based on fuzzy relations is introduced, the concepts of feasible and (α, β)-maximal and minimal solutions are defined. The class of crisp (classical) MOLP problems can be embedded into the class of FMOLP ones. Moreover, for FMOLP problems a new concept of duality is introduced and the weak and strong duality theorems are derived. The introduced concepts and results are illustrated and discussed on a simple numerical example.

Analysis of Change Point in Cox Regression Model With Application to Unemployment Data

Soňa Reisnerová
Charles University, Prague, Czech Republic

Abstract. The paper deals with the Cox regression model for hazard function and considers the case of abrupt change of the effect of some covariates. The consistent estimators of all parameters are provided with their asymptotic distributions. The model is adapted to the analysis of real monthly observed unemployment data from 1/1998 – 6/2003 modeled as a discrete-time series of Poisson counts.
This work was supported by the Grant Agency of the Czech Republic (GACR 402/04/1294).

Are Reduced Forms Of Dornbusch Monetary Model Really Reduced?

Eva Rublíková
University of Economics, Bratislava, Slovakia

Abstract. Slovakia and Poland belong to the countries that joined the European Union in May 2004. The both countries are in the perspective of introducing Euro in 2009. In these circumstances it is highly welcome to carefully examine what are the determinants of exchange rates in Poland and in Slovakia. Since we can observe systematic increase in trade between Poland and Slovakia it seems to be necessary to study the influence that these economies have on each other. In this article we present the results of estimates made for Poland and Slovakia. We would like to examine whether there is a correlation between monetary policy in these countries and the exchange rate of Slovak crown against Polish zloty.

Equity and Efficiency in a Measure Space with Nonadditive Preferences: The Problem of Cake Division

Nobusumi Sagara[1] and Milan Vlach[2;3]
1) Hosei University, Tokyo, Japan, 2) Charles University, Prague, Czech Republic, 3) Kyoto College of Graduate Studies for Informatics, Kyoto, Japan

Abstract. This paper considers a classical problem of cake division ina nonatomic finite measure space among finitely many individuals. We investigate a nonadditive continuous preference relation in a Borel σ-field and prove the existence of Pareto optimal envy-free partitions, Pareto optimal α-equitable partitions, and α-Rawls optimal partitions. We also show that Pareto optimal α-equitability is equivalent to α-Rawls optimality, but Pareto optimality does not imply Rawls optimality.
The first author gratefully acknowledges the financial support by Grant-in-Aid for Scientific Research (No. 14730021) from the Japan Society for the Promotion of Science, and by Special Assistance for Promoting the Advancement of the Education and Research of the Private Universities on "International Research Project on Aging (Japan, China and Korea)" from the Ministry of Education, Culture, Sports, Science and Technology.

Comparison the Quality of Classification Algorithms

Hana Skalská
University of Hradec Kralove, Czech Republic

Abstract. This article summarises and describes different measures of the predictive quality (performance) of classification models. Quantitative measures of quality can be complemented with the visual representation. One of the best known is the ROC (Receiver Operating Characteristic) curve that represents the performance of binary classification model within the full range of conditions (costs and class distributions) of discrimination. The duality between ROC and expected costs of a classifier (cost curve) is described in more details here. Cost curve measures the difference in performance of two classifiers directly in expected costs (EC). The use of ROC and EC is highly important when asymmetric misclassification costs, imbalanced probabilities of classes or changing conditions occur. A hybrid classifier can be found on the convex hull (ROCCH) of the ROC curves of different classifiers. This is potentially the best classification model for any mixture of outside constraints. Lower envelope of cost curves of different classifiers corresponds to ROCCH in ROC space.
This paper was partly supported by the Grant Agency of Czech Republic – grant No 402/04/1308

Mean Variance Optimality in Markov Decision Chains

Karel Sladký, Milan Sitař
Academy of Sciences of the Czech Republic, Prague

Abstract. In this note, we consider discrete-time Markov decision processes with finite state space. Recalling explicit formulas for the growth rate of expected value and variance of the cumulative (random) reward, algorithmic procedures for finding optimal policies with respect to various mean variance optimality criteria are discussed.

Forecasting in Continuous Double Auction

Martin Šmíd
Academy of Sciences of the Czech Republic, Prague

Abstract. Recently, the continuous double auction, i.e. the trading mechanism used in the majority of the financial markets, is the subject of an extensive study. In the present paper, a model of the continuous double auction with the completely random flow of the limit orders is studied. The main result of the paper is an approximate formula for the distribution of the market price and the traded volume at the time τ given the information available at $t < \tau$.
This work was supported by grant no. 402/04/1294 and by grant no. 402/03/H057 of the Czech Science Foundation and by grant no. 454/2004/AEK/FSV of the Grant Agency of the Charles University.

The Use of Interactive Methods in Multiple Criteria Resource Scheduling Problems

Tomáš Šubrt
Czech University of Agriculture in Prague, Czech Republic

Abstract. The aim of the paper is to present one possibility of implementation interactive methods for solving some multiple criteria programming problems in project management such as Compromise Critical Path (CCP) in combination with resource cost minimization. The problem of CCP has already been published in last MME proceedings. Now the whole CCP concept will be compared with traditional resource scheduling methods and later on enriched of using ALOP method.

Live OR: IFORS tutORial Project

Moshe Sniedovich
The University of Melbourne, Australia

Abstract. In this paper we provide information about the tutORial project organised by the international Federation of OR Societies (IFORS). This includes details on the more than thirty on-line modules currently available on the project's web site (www.ifors.org/tutorial/) covering main stream OR/MS topics ranging from elementary linear algebra, to linear programming integer programming and dynamic programming. We also discuss issues related to the incorporation of the these modules in OR/MS courseware, including technical and pedagogical issues related to the use of the modules by lecturers, students and the public in general.

Time Consistent Monetary Policy in Slovak Economy

Karol Szomolányi
University of Economics, Bratislava, Slovakia

Abstract. Alvarez, Kehoe and Neymeyer (2004) by dynamic Ramsey model of monetary economy showed that if (a) present value of nominal public debt is vanish in each time, (b) aggregate preferences of agents are separate able and homothetic, (c) in economy are only consumption taxes, sequential rational behavior of the government is time consistent if and only if the Friedman rule of setting nominal interest rates to zero is fulfilled in each time (Friedman, 1969). By these terms, template of monetary policy should be: make environment for government, that it can behave sequentially rational by applying of Friedman rule. The object of the paper will be to find Friedman rule in Slovak economy.

Portmanteau Tests Based on Kendall's Autocorrelation Coefficients

Miroslav Šiman
Charles University, Prague, Czech Republic

Abstract. Portmanteau tests based on serial Kendall's autocorrelation coefficients will be proposed and their usefulness will be judged by a small but representative Monte Carlo study dealing with testing for conditional heteroskedasticity. Besides, acceptable approximations to variances of these coefficients at higher lags will be found.

Fuzzy Probability Spaces in Decision-Making under Risk

Jana Talašová, Ondřej Pavlačka
Palacky University Olomouc, Czech Republic

Abstract. In this paper, two types of fuzzy probability spaces will be introduced and their possible applications in methods of decision-making under risk will be described. First, a fuzzy probability space that generalizes the classical probability space to the situation of fuzzy random events will be studied. It can be applied e.g. when given continuous probability distribution of risk factors are to be approximated by discrete ones. Second, a fuzzy probability space that enables an adequate mathematical modeling of expertly set uncertain probabilities of elementary events will be defined. Its application in fuzzy decision matrices will be shown.

Basic Ways of Monte Carlo Simulation to Efficient Pricing of European Options

Tomáš Tichý
Technical University of Ostrava, Czech Republic

Abstract. We can distinguish many ways to price nonlinear financial derivatives. Monte Carlo simulation is the method which is very useful mainly in pricing of non-linear types of financial derivatives - options with complicated payoff functions or when complex underlying processes are considered. In this paper we suppose Variance Gamma process, which can be regarded as a subordinated Brownian motion. We run basic variance reduction techniques to increase the effciency of the plain Monte Carlo method in pricing of options. Plain vanilla call option is supposed to allow the comparison of all methods with the "true" price. All results are also compared to the standard case of geometric Brownian motion.
Substantial part of this research was done under the support provided by GA·CR within the project No. 402/05/P085. Some algorithms written in Mathematica® were developed under the project No. 402/04/1357.

Sparse Parameter Estimation in Economic Time Series Models

Jaromír Tonner
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Abstract. The aim of this contribution is to study techniques and algorithms which are appropriate for modeling and analysis of data in economic models with a lot of parameters. So the aim is to reach a reduction of information underlying in data into the least possible number of parameters and to find their estimates with appropriately constructed and numerically stable algorithms. An attention will be devoted to predictions in economic time series and for estimation of parameters in models of small opened economics. An identification of redundant parameters and their displacement from the model will enable us an essential reduction of uncertainty of estimations of the rest of significant parameters. In this article we would like to explain and demonstrate the techniques based on ℓ_1 optimization for the estimation of parameters in models of univariate time series (ARIMA models). We will use simulated data as well as real data.

A Numerical Method for Solving Optimal Control Problems

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1) Arbeit und Bildung e.V., Marburg, Germany, 2) Georian Technical University, Tbilisi, Georgia

Abstract. A numerical method is developed for solving optimal control problems. There is realized an approach, so that an infinite-dimensional optimization problem is reduced to a finite-dimensional one, which is solved by a nonlinear programming method - the gravitation centers method (GCM). By applying GCM we find an optimal control, which can be of an arbitrary structure. We can solve two-point boundary value problems by applying algorithmic tools of random sampling. At the same time with GCM we obtain an optimal solution with an admissible accuracy and minimal consumption of computer time. A numerical example illustrates the efficiency of the developed method for optimal control problems.

Copulas - Risk Measures of Association

Karel Vaníček
Charles University, Prague, Czech Republic

Abstract. We introduce an application of the copula theory in the field of integrated risk management (IRM). We first remind some properties of commonly used dependence measures. The axiomatic defnition of copulas, Sklar's theorem and some well-known general properties of copulas are presented in the following section. In the third section we define Archimedean copulas with their generators and present a simple way of computing important measures of association - Kendall's tau and Spearman's rho. Examples of parametric families are presented at the end of this section. In the last section we present possible parameter estimation procedures and simulation techniques that can be applied to the individual set of data.

A Model Interpretation of the Czech Inflation Targeting and the Monetary Policy

Osvald Vašíček, Karel Musil
Masaryk University in Brno, Czech Republic

Abstract. The paper introduces a New Keynesian DSGE model that describes the inflation targeting policy in the Czech economy. This model is based strictly on microfoundations and consists of representative finished and intermediate goods–producing firms, representative households and a central bank. The central bank implements its policy according to the generalized Taylor rule. A suitable method for solving the model is the Kalman filter evaluating a likelihood function and the Kalman smoother evaluating a time series of a smoothed estimate of the unobserved state variable (target inflation). The model seems to give an approximation of the behavior of the Czech economy.
This paper has been worked as a part of a project at the Center of Czech Economy Competitiveness Research (identification code 1M0021622405).

Credit Scoring Methodologies

Martin Vojtek, Evžen Kočenda
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Abstract. In this paper we identify the methods used in the process of credit scoring of applicants for a commercial loan and perform their theoretical analysis. We are interested in their possible application in the framework of post-transition countries. We concentrate on retail loans as the sharp increase in the amount of loans for this clientele has been recorded in the last few years. The empirical study based on the above specified models can answer the question what are the main determinants (what variables inuenced the decision) of approving the loan application in the existing practices of local banks. It also will clarify what are the determinants for defaulting loan by debtor.
We acknowledge the support by grant of the Grant Agency of the Czech Republic.

Bayes Analysis of Time Series With Covariates

Petr Volf
The Academy of Sciences of the Czech Republic, Prague

Abstract. In the last decade, the Bayes methods (often supported by MCMC computations) lead to the use of enhanced statistical models, hardly tractable by standard approaches. It concerns also to time series analysis, where the autoregressive character can be incorporated already to Bayes prior model (again, a richer notion than mere prior distribution) and one can consider simultaneously a similar time development of other parameters. In present contribution the methodology is used to the analysis of time series of aggregated unemployment data, a part of proposed model is the regression on covariates (age, gender, region) and time-dependent variance.
The research is supported by the grant of GA ČR 402/04/1294.

Metaheuristics in Automated Storage and Retrieval Systems

Blaž Zmazek[1,2], Janez Žerovnik[1,2]
1) University of Maribor, Slovenia, 2) Institute of Mathematics, Physics and Mechanics, Ljubljana, Slovenia

Abstract. This paper proposes the use of some metaheuristics to improve the performance of AS/RS; focusing attention on storage and retrieval policies, on-board storage capacity, S/R machine operation modes, and dwell point determination.

Solving Some Types of Location Problems

Karel Zimmermann
Charles University, Prague, Czech Republic

Abstract. Problems of finding optimal location of n service centers are considered. Each service centre must be located in exactly one of n k-dimensional areas (k = 1, 2, 3) with given exit (entrance points). The service centres supply services to m customers. The distances of the customers from the exit (entrance) points are known. Problems with various optimality criteria and methods for their solutions will be surveyed. Both deterministic and stochastic versions of the problems will be considered. The post-optimal sensitivity analysis of such problems and some geometrical questions connected with such problems will be discussed.

Approach to Real Option Model Application on Soft Binomial Basis. Fuzzy - Stochastic Approach

Zdeněk Zmeškal
Technical University of Ostrava, Czech Republic

Abstract. The real option valuation and decision-making is relatively new concept in financial decisionmaking. The stochastic discrete binomial models and continuous Black-Scholes-Meton models are usually applied. However, there is not in several situations in real option methodology application to have at to disposal input data of required quality. Traditionally, input data are in a form of real (crisp) numbers or crisp-stochastic distribution function. However, in several cases, input data is possible introduce only vaguely, by fuzzy numbers or fuzzy-stochastic distribution function. Hybrid fuzzy-stochastic binomial model under fuzzy numbers (Tnumbers) and Decomposition principle is proposed and described. Input data are in a form of fuzzy numbers and result, possibility-expected real option value is also determined vaguely as a fuzzy set. Illustrative example of valuation firm equity with dividends is presented.
The research was supported by Grant Agency of the Czech republic (GAČR) CEZ:02/04/1357 this support is gratefully acknowledg

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