SECTION 6
Applied Mathematics in Macroeconomics and Microeconomics

Room 2623

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Thursday, April 22, 2004

11.30-11.50 **1. Some Sufficient Optimality Conditions for Nondifferentiable Multiobjective Variational Problems**

Author: Lecturer ***Sorina Gramatovici***, PhD, Academy of Economic Studies, Bucharest, Romania

Abstract

Nondifferentiable multiobjective variational problems were recently studied by many authors. Wier and Mond (1989), Aghezzaf and Hachimi (2000), Egudo (1989), Gulati and Islam (1994) established duality theorems using efficient solutions (Pareto optimum) and properly efficient (Geoffrion) solutions. Bector and Husain (1992) obtained duality results under convexity hypothesis, Chen (1996), Kim and al.(1997,1998) studied nondifferentiable multiobjective variational problems involving invex, pseudoinvex functions.

Recently, Preda (1992) introduced (F,)-convexity as an extension of F-convexity introduced by Hanson and Mond (1982) and -convexity introduced by Vial (1982) and Jeyakumar (1985).

In this paper we extend the concept of (F,)-convexity to the class of vector –valued functions and we obtain sufficient optimality conditions for a class of nondifferentiable multiobjective variational problems involving (F,)-convex, (F,)-pseudoconvex, (F,)-quasiconvex functions etc.

11.50-12.10 **2. Determining Pareto Solutions for Multiobjective Discrete Control Problem on Networks**

Authors: Professor ***Dorian Drucioc***, PhD
Professor ***Dumitru Lozovanu***, PhD
Professor ***Mihai Popovici***, PhD,
Institute of Mathematics and Computer Science, Academy of Sciences, Chişinău, Moldova

Abstract

We study multiobjective control of time-discrete systems with finite set of states. The main results are concerned with determining Pareto solutions for multiobjective version of the following discrete optimal control problem [1-3].

Let L be a time-discrete system with finite set of states X. At every time-step $t = 0,1,2,...$ the state of L is $x(t) \in X$. Two states x_0 and x_f are given in X where $x_0 = x(0)$ represents the

starting point of L and x_f is the state in which the system must be brought, i.e. x_f is the final state of L. We assume that the system L should reach the final state x_f at the time moment $T(x_f)$, such that

$T_1 \le T(x_f) \le T_2$,

where T_1 and T_2 are given.

The dynamics of system L is discribed by a directed graph $G=(X,E)$, where the vertices $x \in X$ correspond to the states of L and an arbitrary edge $e=(x,y) \in E$ identify the possibility of system's passage from the state $x=x(t)$ to the state $y=x(t+1)$ at every moment of time $t=0,1,2,...$. So, the set of edges $E(x)=\{e=(x,y)/(x,y) \in E\}$ originated in x correspond to admissible set of control parameters which determine the next possible states $y=x(t+1)$ of L if the state $x=x(t)$ at the moment of time t is known. Therefore we consider $E(x) \neq 0$, $\forall x \in X \setminus \{x_f\}$, and $E(x_f)=0$. In additional we assume that to each edge $e=(x,y) \in E$ is associated a cost function $C_e(t)$ which depends on time and express the cost of system L to pass from the state $x=x(t)$ to the state $y=x(t+1)$ at the stage $[t,t+1]$.

The graph of states transitions on which edges time depending cost functions are defined, and in which two verteces corresponding to the starting and the final states of the system are chosen, is called a dynamic network [3].

For given dynamic network we regard the problem of finding a sequence of system's transitions $(x(0),x(1))$, $(x(1),x(2))$. ..., $(x(T(x_f)-1),x(T(x_f)))$ which transfer the system from the starting state $x_0=x(0)$ to the final state $x_f=x(T(x_f))$, such that $T(x_f)$ satisfy the condition

$T_1 \le T(x_f) \le T_2$,

and the integral time cost

$$F_{x_0 x_f} = \sum_{t=0}^{T(x_f)-1} C_{(x(t),x(t+1))}(t)$$

of system's transitions by a trajectory

$x_0=x(0)$, $x(1)$, $x(2)$, ... , $x(T(x_f))=x_f$

is minimal.

This problem generalize the well-known shortest path problem in a weighted directed graph [4] and arose as an auxiliary one when solve the minimum-cost flow problem on dynamic networks [5]. Algorithms based on dynamic programming method for finding the optimal trajectory in dynamic networks have been elaborated in [3].

We have formulated and studied the mentioned above problem when the dynamics of the system is controlled by p actors (players) and each of them intend to minimize his own integral time cost of system's transition by a trajectory. Algorithms based on dynamic programming technique for determining Pareto solutions for multiobjective version of the control problem on dynamic network have been developed.

12.10-12.30 **3. The Multiobjective Linear Fractional Programming Model**

Author: Professor ***Alexandra Tkacenko***, USM, Chişinău, Moldova

Abstract

In the proposed work is investigated the field of the multicriteria linear fractional programs. Particularly, is studied the case of the identical denominators. In our paper is presented an example in idea of development the fond procedure of nondominated solutions map.

Keywords: Multiple criteria; fractional programming

In the optimization problem, of greater interest in recent times, especially in economic decision situation, present the ratios like: benefit/employees, output/employees. These ratios have the identical denominators. Within the restrictions, the denominators may be positive or negative, but never zero. Obviously, this method may be to apply for the restricted class of problems, but is computationally superior. In [2] Nykowski proposed the method for solving the multiobjective fractional problem, including the cases of different denominators. This method converted the MOLFPP into MOLPP, after that we propose to solve more problems of linear programming. In case of identical dominators the proposed method will have to solve less objective functions than applying the method of Nykowski [2]. This method is computationally superior, but may be applied for a restricted class of problems.

Let us consider solving a three-objective LFPP defined as follows:

$$\max\left[z_1=\frac{m(x)}{l(x)};z_2=\frac{n(x)}{l(x)};z_3=\frac{k(x)}{l(x)},\right]$$

where $D=\{x|A_x\le b;x\ge 0;x\in R^n\}$ is a nonempty, convex and compact set in R^n.

The transformation y=tx, (t is scalar) was made by Charnes and Cooper [1] to obtain a two linear programming problem from the single linear fractional objective problem.

Applying the conclusions from [4] we may state: it is sufficient to solve only one of equivalent multiple criteria linear programming problem, which depends on the sign of denominator.

12.30-12.50 **4. The DEA -type Model in the Study of the Economical Efficiency Indexes.**

Author: Professor ***Tkacenko Dumitru***, PhD, Chişinău, Moldova

Abstract

In this work we will present an analysis of the economic situation of some branches of Moldova.This was possible using the technique DEA (data envelopment analysis) of the mathematical programmer approach. We're provided an analysis of some certain data concerning the efficiency or inefficiency of the branches using the Efficiency Measurement Program(EMS).

The technical efficiency of a productive unit is a comparison between observed and optimal values (defined in terms of production possibilities) of its output and input. The economic interpretation of the Malmquist productivity index is that it measures the relative change in either input- conserving or output- expanding efficiency between two periods with reference to the same frontier technology.

We have performed the efficiency analyses on a data set for 17 economical branches of Moldova by 1993-2001 period. Studding the results of a forward-looking approach we can notice what the practical results confirm again the theoretical results on maintaining the relations of equiproportionality between inputs and outputs in economic efficiency studies.

12.50-13.10 **5. Fuzzy Techniques for Net Value Discounting**

Authors: Professor ***Virginia Mărăcine***, PhD
Student ***Ana-Maria Toader***
Student ***Roxana Vasilescu***
Academy of Economic Studies, Bucharest, Romania

Abstract

Stated informally, the essence of this principle is that as the complexity of a system increase, our ability to make precise yet significant descriptions about its behavior diminishes until a threshold is reached beyond which precision and significance (or relevance) becomes almost mutually ***exclusive characteristics****."*

Lotfi Zadeh, "The Incompatibility Principle"

Many economic problems dealing with the fact that, even if the used methods and techniques for their solving are precise, the input data are imprecise.

In all those cases, the fuzzy logic is a natural bridge between the quantitative and the qualitative world, giving, quantitatively speaking, a cost effective model for simulate a complex reality that implies numerical variables, and giving a qualitative description for the reality which they formalize.

There are many domains in which fuzzy concepts and techniques are used. The economic field is just one of those, but is an important one due to its implications. Today, the great majority of the decisions making processes use fuzzy-expert-systems, bring in this way the optimization techniques closer by the real needs of the human decider.

It is the case in financial decisions. And here, we face an entire set of discounting operation. Are they precise enough using the classical bivalent logic? Maybe yes, maybe not, depending by the particular economic problem. But we intent to present in this paper an alternative option to these classic techniques.

13.10-13.30 **6. Imprecise Goal Programming Model**

Author: Professor ***Florica Luban***, Ph.D, Academy of Economic Studies, Bucharest, Romania

Abstract

Goal programming is a multiple objective optimization method, which keeps in mind the decision maker's preferences. These preferences are reflected, on one hand by the fixation of the aspiration levels and, on the other, by the rank of the objective functions following their relative importance. In standard goal programming it is assumed that the decision maker is able to determine precisely the aspiration levels, what is not realistic. In this paper it is shown that the imprecise of the decision maker can be expressed through fuzzy sets whose memberships functions represent the decision maker's satisfaction degree, regarding the achievement of the goals.

Chairman: Professor ***Dumitru Lozovanu***, PhD

15.30-15.50 **7. Optimality Conditions for a Special Class of Non-differentiable Minimax Fractional Programming Problem with Square Root Term**

Authors: Professor ***Vasile Preda***, PhD
Professor ***Anton Bătătorescu***, PhD
Faculty of Mathematics, University of Bucharest, Romania

Abstract

We consider the following continuous differentiable mappings:

$$f:\mathbb{R}^n\times\mathbb{R}^m\to\mathbb{R},\quad h:\mathbb{R}^n\times\mathbb{R}^m\to\mathbb{R},\quad g:\mathbb{R}^n\to\mathbb{R}^p,$$

with $g=(g_1,g_p,...,g_p)$. We denote $P=\{x\in\mathbb{R}^n \mid g_j(x)\le 0,\ j=1,2,...,p\}$ and consider $Y\subseteq\mathbb{R}^m$ to be a compact subset of $\mathbb{R}^m$. Let B be an $n\times n$ positive semidefinite matrix such that for each $(x,y)\in P\times Y$, we have

$$f(x,y)+\sqrt{x^{\mathrm{t}}Bx}\ge 0$$

$$h(x,y)-\sqrt{x^{\mathrm{t}}Bx}>0$$

We establish necessary and sufficient optimality conditions for the following non-differentiable minimax fractional programming problem:

$$\inf_{x\in P}\sup_{y\in Y}\varphi\left(\frac{f(x,y)+\sqrt{x^{\mathsf{T}}Bx}}{h(x,y)-\sqrt{x^{\mathsf{T}}Bx}}\right)$$

where $\varphi:\mathbb{R}\to\mathbb{R}$ is a real function having certain properties.

15.50-16.10 **8. Stable Sets and Cores in the Competitive Models**

Authors: Professor ***Anton Ştefănescu***, PhD, Faculty of Mathematics, University of Bucharest, Romania

Abstract

The core and the von Neumann-Morgenstern solutions (stable sets) are the main solution-concepts both in the cooperative game theory, and in the economic analysis. Most known results focused on core which seems to be a more handleable notion, while the theory of stable sets is rather poor.

A special situation occurs when the core can be identified as a stable set. This is the case of convex games, or more generally, of the games having large cores.

Our approach concerns mainly the exchange economies. We have identified conditions under which the core (or the strict core) is the unique stable set. Additionally we established results concerning the existence and the uniqueness of stable set for both the cases of finitely many agents and of a continuum set of agents.

16.10-16.30 **9. Data Dependence and Comparison Results for the Solutions Set of a Mixed Type Functional-integral Equation**

Authors: Professor ***Viorica Mureşan***, PhD, Department of Mathematics, Technical University of Cluj-Napoca, Romania

Abstract

In the paper we give data dependence and comparison results for the solutions set of the following Fredholm-Volterra integral equation with linear modification of the argument

$$x(t)=F(t,x(a),\int_a^b H(t,s,x(s),x(\lambda s))ds,\int_a^t K(t,s,x(s),x(\lambda s))ds),\quad t\in[a,b],0<\lambda<1,$$

where $a=0,b>0$ or $a<0,b=0$ or $a<0,b>0$.

Here $H\in C([a,b]\times[a,b]\times X\times X,X),K\in C([a,b]\times[a,b]\times X\times X,X)$,

$F\in C([a,b]\times X\times X\times X,X)$ and $(X,\|\cdot\|)$ is a Banach space.

Our results are more general as that obtained in [2].

16.30-16.50 **10. On Some Homogeneous and Quasi-homogeneous Economic Growth Models**

Authors: Professor ***Nicolaie Lungu,*** PhD

Lecturer ***Tiberiu Torsin***, PhD

Assistant ***Sorina Anamaria Ciplea***, PhD Student

Department of Mathematics, Technical University of Cluj-Napoca, Romania

Abstract

Theory of economic growth is based on non-linear systems of differential equations. In this paper are presents certain consideration on abstract Gronwall-lemma established by I. A. Rus, and

some operatorial inequalities which are deduced from this lemma and applied to some homogeneous and quasi-homogeneous models for economic growth.

16.50-17.10 11. Admissible Trajectories in the Homicidal Chauffeur Differential Game

Authors: Professor ***Ştefan Mirică***, PhD
Touffik Bouremani, PhD
Faculty of Mathematics, University of Bucharest, Romania

Abstract

We consider the well-known Isaac's differential game of „homicidal chauffeur" and use a certain generalizations of Cauchy's Method of characteristics for „stratified" Hamilton-Jacobi equations and also computer numerical results for „constrained" differential systems to describe its admissible trajectories.

In this paper we obtain the set of all admissible trajectories and prove that it is much larger than the sets described in the previous works of Bassar and Olsder (1995), Isaacs (1965), Mertz (1971), Patsko and Turova (2001), etc. In particular, we prove the existence of a „barrier" and describe the domain from which no admissible trajectories are starting.

The identification of all the admissible trajectories and their organization as „Hamiltonian flows" is the first step toward the identification of corresponding admissible and, respectively, optimal feedback strategies that describe the complete and rigorous solution of the problem.

17.10-17.30 12. Competitive Solutions for Competitive Games

Author: Professor ***Gheorghe Ciobanu***, PhD, Academy of Economic Studies, Bucharest, Romania

Abstract

In the paper, we intend to approach the problem of the power division between economic agents.

We consider that the agents can commit to form coalitions in order to improve the utility of their consumption plans.

The result of the coalitions is supposed acquaintance so, the possibility of coalitions is the competitive solution that defines the correct distribution of the profit between agents. The problem is a cooperative games and is based on the negotiation model between the between the agents.

Friday, April 23, 2004

Chair: Professor ***Alexandra Tkacenko***, PhD

14.30-14.50 **13. Modeling the Agent's Optimistic and Pessimistic Attitudes Towards Uncertainty**

Author: Economist ***Corina Nicoleta Irimiea***, Romanian Commercial Bank, Bucharest, Romania

Abstract

Optimism and pessimism are recognized as important determinants of economic behavior and can explain, to a certain extent, the behavior inconsistent with the expected utility theory.

An agent whose attitude towards uncertainty is represented by a capacity on the set of all events can express his preferences by means of a Choquet expected utility functional.The convexity (concavity) of the capacity captures the agent's attitude towards uncertainty. An optimistic agent overestimates the likelihood of good outcomes, while a pessimistic one overestimates the likelihood of bad outcomes.

Supposing that the consequences are ordered from the best outcome to the worst one, and the set of consequences are partitioned in three closed intervals relative to a reference point (current income or wealth), the agent's preferences can be represented by means of a Choquet expected utility functional in which the customary outcomes are weighted according to their linear expectation while the others are overweighted.

In addition, it is possible to obtain a Choquet expected utility representation as a linear combination of the expected utility over all gains and losses and the utility of the extreme outcomes.

14.50-15.10 **14. Evolutive Optimization of Fuzzy Cutting Stock Problem**

Authors: Professor ***Csaba Fabian***, PhD
Professor ***Rodica Mihalca***, PhD
Academy of Economic Studies, Bucharest, Romania

Abstract

An excellent material saving method in different industries is the efficient solving of cutting stock problems. but this problem is a combinatorial optimizations problem with height complexity. The practical cutting stock problems can contains also fuzzy right hand sides or /and fuzzy objective function coefficients Starting from this two considerations we propose the using evolutive algorithms for fuzzy cutting stock problem, our main objective is to obtain good solution in a reasonable solving time**.**

Keywords: fuzzy cutting stock problem, evolutive algorithms

15.10-15.30 **15. Usage of genetic algorithms in a particular cover of a specific square area**

Author: Assistant **Laszlo Illyes,** PhD Student, Sapientia University, Miercurea Ciuc, Romania

Abstract

We consider "The optimal cover of an n-dimensional chessboard with different unit dimensional cubes", the optimal solution signifying the cover of the chessboard in a way, that the remaining area of uncover elementary square has to be minimum.

The problem is complex, because it has many possible, acceptable solutions. I propose genetic algorithms to find theoretical and practical solutions.

We mention, that a sofware company from Great Britain made an offer of 1000 Pounds for better solutions that exists today, and any solution is welcome.

Keywords: optimal cover, genetic algorithms, degree of freedom

15.30-15.50 **16. The Econometric Modeling, in a Microeconomic Approach**

Authors: Lecturer ***Tatiana-Corina Dosescu***, PhD Student, Dimitrie Cantemir University, Bucharest, Romania
Senior Lecturer ***Constantin Raischi***, PhD, Academy of Economic Studies, Bucharest, Romania

Abstract

It is discussed the econometric modeling of phenomenon's and processes, especially at a microeconomic level, emphasizing the essential characteristics of the econometric thinking, which underlies the construction of an econometric model.

Afterwards, it is explained the necessity of constructing a series of econometric models in order to increase the adaptation degree to the economical reality, illustrating with classic econometric models of linear regression, with generalization of these models, with classic models of time series and finally, with a detailed approach of simultaneous equations model.

Lastly, it is approached the question of computer experiences, in order to test the ability to predict an econometric model.

Chair: Professor ***Vasile Preda*****,** PhD

16.30-16.50 **17. The Use of Kernel Techniques in approximating the Probability Laws**

Author: Professor ***Gheorghe Ruxanda,*** PhD**,** Academy of economic Studies, Bucharest, Romania

Abstract

The paper presents the mode of using the Kernel type methods for evaluating the probability densities. This type of techniques are used within the context of methods and techniques for pattern recognition and for evaluating the balanced type regression models.

16.50-17.10 **18. On some one-dimensional optimization algorithms**

Author: Lecturer ***Radu R. Şerban***, PhD Student, Spiru Haret University, Bucharest, Romania

Abstract

In the paper several modifications of some well-known one-dimensional optimization algorithms are presented.

17.10-17.30 **19. Two ways to define graph distance. Path distance versus cut distance**

Author: Lecturer ***Dorin Mitrut***, PhD, Academy of Economic Studies, Bucharest, Romania

Abstract

In an arbitrary graph, **path distance** is the classic one, where the length is naturally defined by the sum of edge weights along the path. We define the *distance* between two vertices, *A* and *B*, to be the minimum of the length paths from *A* to *B*.

Cut distance is defined using the length of a curve by the number of edges that cut that curve**.** Then, the distance between two vertices A and B is defined as a minimum number of edges have to be cut to rich B from A.

The aim of this article is to present some applications of the cut-distance, to compare the two distances and to present some situations where cut-distance is better.

17.30-17.50 **20. On the Dyckhoff Model of the 1-dimensional Cutting Stock Problem**

Author: Professor ***Vasile Nica*****,** PhD, Academy of Economic Studies, Bucharest, Romania

Abstrac**t**

The classical Gilmore Gomory model formalizes the 1 – dimensional cutting stock problem using the concept of cutting pattern. The Dyckhoff model is an alternative approach based on the concept of cut. Some properties of the second model and some other practical questions are discussed.

17.50-18.10 **21. Optimal risk allocation and estimation of reserve in an insurance company**

Author: Dumitru Tudor**,** Student, Academy of Economic Studies, Bucharest, Romania

Abstract

In an insurance company, the portofolio is very diversified because of the occurrence of insured risk and because of the distribution of number of claims. Establishing the optimal reserve and the amount of claims to be reinsured are very serious problems for any insurer. The main idea of this paper is to split the entire company's portofolio (which is heterogeneous because there are many different probabilities for the occurrence of insured risk) in homogenous sub portofolios where we have very close probabilities which will allow us to better estimate optimal reserve and to establish the amount of claims to be reinsured. We will use stochastic methods in order to get an asymptotic estimation of optimal reserve.