

SECTION: OPTIMIZATION THEORY AND APPLICATIONS

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MULTIOBJECTIVE OPTIMIZATION INVOLVING GENERALIZED CONVEXITY

Abstract

The field of multiobjective programming has developed in many directions in the settings of optimality conditions and duality theory. For the case of a finite dimensional Euclidian space or Banach space or to a locally convex topological vector space, some authors have put forth successively the corresponding optimality conditions for the problem. This paper deals with the case of the ordered topological vector space. We first introduce the class of subconvex functions and we give a theorem of the alternative in this context. This permits the establishment of the generalized Fritz-John necessary conditions in terms of Gateaux derivatives of multiobjective programming problem in the ordered topological vector space in the context of subconvexity. Thus, the generalized Kuhn-Tucker necessary conditions are obtained with the additional constraint mapping to fulfill the generalized Slater's constraint qualification.

Keywords: multiobjective programming, subconvex functions, generalized Kuhn-Tucker necessary conditions

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AN EXERCISE ON DUALITY

Abstract

It is well known that the algorithm used to solve the classical transportation problem is the primal simplex algorithm of the general linear programming, adapted to the special structure of the problem. The paper describes an alternative method based on the general dual simplex algorithm adapted to the transportation problem. The method is useful in analyzing and solving post-optimization situations.

Key words: transportation problem, dual simplex algorithm, post-optimality

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RESOLUTION OF FLOW-SHOP PROBLEMS WITH GENETIC ALGORITHMS

Abstract

This paper studies the flow-shop scheduling problems with n -jobs processed on m -machines respect on maximize total time.

As the problem is NP-complete, a heuristic based on genetic algorithms is used to solve it.

Keywords: flow-shop, genetic algorithms

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MATHEMATICAL MODELS IN CREDIBILITY THEORY

Abstract

In this paper we give the matrix theory of some credibility models and we try to demonstrate what kind of data is needed to apply linear algebra, probability theory and statistics in the more complicated credibility models.

The credibility method dealt with in this paper is the greatest accuracy theory. The first section contains a description of the model behind a heterogeneous portfolio involving an underlying risk parameter for the individual risks. Since these risks can now no longer be assumed to be independent, mathematical properties of conditional covariances become useful. Some matrix theory is shortly repeated, to be used in the more credibility models. The Bayesian estimators used in credibility theory are derived. Section 2 describes the credibility models of Bühlmann. His original model, involving only one contract contains the basics of all further credibility models. We derive the optimal linearized credibility estimate for the risk premium for this case. It turns out that this procedure does not provide us with a statistic computable from the observations, since the result involves unknown parameters of the structure function. To obtain estimates for these structure parameters, for Bühlmann's classical model we embed the contract in a collective of contracts, all providing independent information on the structure distribution. In the classical Bühlmann model, a portfolio of contracts is studied. Just as in the original model of Bühlmann we will derive the best linearized credibility estimators for this model. The estimators obtained in the previous model contained structure parameters. In this model we assume the structure parameters are unknown, so the expressions for these (pseudo-) estimators are no longer statistics. But since the contracts are embedded in a collective of identical contracts, we now have more than one observation available on the risk parameter, so we can replace the unknown structure parameters by estimates. From the practical point of view, the attractive property of unbiasedness for these estimators is stated. Thus, to be able to use the better linear credibility results obtained in the original credibility model of Bühlmann, we will provide in the classical model of Bühlmann useful estimators for the structure parameters, involving complicated mathematical properties of matrix theory, of conditional expectations and of conditional covariances. Also, we will introduce the recursive credibility model and a credibility model incorporating risk volumes. The credibility estimator from the original model of Bühlmann has been criticized because it gives the claim amounts from all previous years the same weight; intuitively one should believe that new claims should have more weight than old claims. However, as the claim amounts of different years were assumed in the Bühlmann's original model to be exchangeable, it was only reasonable that the claim amounts should have equal weights. The recursive credibility model is an attempt to amend for this intuitive weakness. Our motivation for introducing the present model was that we wanted new claims to have more weight than older claims. In the simple model of Bühlmann we assumed that the risk volume was the same for all years. Often, in particular, in reinsurance, one wants to allow for varying risk volumes, and for that purpose Bühlmann & Straub introduced the credibility model incorporating risk volumes. Section 3 contains a description of the Hachemeister regression model allowing for effects like inflation. We give Hachemeister's model, which involves only one isolated contract. In this section we will give the assumptions of the Hachemeister regression model and the optimal linearized regression credibility premium is derived. Just like in the case of classical credibility model, we will obtain a

credibility solution in the form of a linear combination of the individual estimate (based on the data of a particular state) and the collective estimate (based on aggregate USA data). To illustrate the solution with the properties mentioned above, we shall need the well-known representation formula of the inverse for a special class of matrices. We give a rather explicit description of the input data from linear algebra, for the regression credibility model used, only to show that in practical situations, there will always be enough data to apply regression credibility theory to a real insurance portfolio.

The point we want to emphasize is that practical application of credibility theory is feasible nowadays using appropriate linear algebra.

This paper shows that the matrix theory, is really a useful tool-perhaps the only existing tool-for the study of credibility models.

So the mathematical properties of matrix theory, of conditional expectations and of conditional covariances become useful in the more complicated credibility models.

The fact that it is based on complicated mathematics involving linear algebra, needs not bother the user more than it does when he applies statistical tools like discriminatory analysis, scoring models, GLIM and SAS. These techniques can be applied by anybody on his own field of endeavor, be it economics, medicine, or insurance.

Keywords: the risk premium, the credibility calculations, recursive credibility estimation, a credibility model incorporating risk volumes, regression credibility theory.

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CREDIBILITY RESULTS FOR A TWO-LEVEL HIERARCHICAL MODEL

Abstract

In this article we first give the two-level hierarchical model of Jewell, involving a portfolio of contracts, which can be broken up into sub-portfolios (sectors), each consisting of groups. In Section 1 we will give the assumptions of the hierarchical model with two levels and the question to be solved is: find (credibility) estimates for the pure risk premium of the class (which is a set of the contracts, often referred to as a contract again), for the pure risk premium of the sector. To be able to use the results from this section, one still has to estimate the unknown structural parameters that will occur in the credibility premiums at sector level and at contract level.

Combining the statistics of all sectors enables us to derive estimates for the structure parameters on the sector level, and also combining the statistics of the different contracts enables us to derive estimates for the structure parameters on the contract level. Some unbiased estimators are given in Section 2. This completes the solution of the hierarchical credibility model in case of non-homogeneous linear credibility estimates. When one considers homogeneous linear credibility approximations, see Section 3, again one obtains the results with the parameters estimated as in the previous section. Jewell's hierarchical model is a two level classification procedure. It is clear that this process can be generalized to any number of levels. Section 4, contains a description of the hierarchical model with three levels. So, one might create a multi-level hierarchical model by, e.g. grouping sectors into cohorts, and have different structure parameters for each level. The risk parameters pertaining to a certain contract are a random vector, of which the last component is unique for the contract at hand the next-to-last for the sector the contract is in, and so on.

The credibility method dealt with in this paper is the greatest accuracy theory.

This article contains a hierarchical model with three levels, for determining the linearized non-homogeneous and homogeneous credibility premiums at company level, at sector level and at contract level, founded on the relevant covariance relations between risk premium, the observations and the weighted averages.

The fact that it is based on complicated mathematics, involving conditional expectations, needs not bother the user more than it does when he applies statistical tools like SAS, GLIM, discriminatory analysis and scoring models.

These techniques can be applied by anybody on his own field of endeavor, be it economics, medicine or insurance.

We give a rather explicit description of the input data for the multi-level hierarchical model used, only to show that in practical situations, there will always be enough data to apply credibility theory to a real insurance portfolio.

Keywords: hierarchical structure with three levels, observable variables with associated weights, the credibility results.

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REGRESSION FOR FUZZY DATA

Abstract

This work proposes a method for parameters estimation when the input data are fuzzy numbers. We transform the fuzzy numbers in closed intervals bounded by functions with some certain properties. The norm in the developed space of fuzzy numbers is the distance between the images of these two functions. Next is given an algorithm that transforms the problem of estimation into a minimization problem, more precisely, a minimization of a convex function.

Keywords: fuzzy numbers, regression

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MATHEMATICAL FORMALISM AND SIGNIFICANCE IN ECONOMICS: A REVIEW OF CRITICISM

Abstract

The mainstream economics in both its micro and macro search for relevance in respect to people, organizations', and countries' behavior lays its analytical foundations on a rigorous set of methodological requirements. It has thus evolved not only as a quantitative science, but as an "exemplar of rationality" next only to physics (Mirowski 2004, 170). It is the purpose of this contribution to enlist the main lines of attack against that widespread belief, as well as to provide a substantial discussion as to the extent of the use of mathematical formalism distorts the significance of economic facts. To that end, this material has made recourse to the existing literature and has organized it around four dominant points of argumentation.

A first hint comes from the skepticism which the very outstanding exponents of quantitative economics expressed at some point along their career, usually after being recognized for their prominent stature within the economics realm. The most notorious examples are John Hicks, John Maynard Keynes, Georgescu-Roegen or Joseph Stiglitz. A different blend of scientists is represented by those econometricians (Neyman, Pearson, Leamer) who always were aware of the limits to which formalism can be of any help to social sciences in general. All these intellectuals' recurrent theme sheds light on the meaninglessness which the modeling of economic phenomena bears for understanding of economic evolutions.

A second cluster of arguments has been similarly gathered along the history of economic thought with the notable difference that this time the main objection regards the quantitative adoption of formalism from the point the view of its economic relevance. Several pioneering statisticians like Venn, Neyman, or Pearson long ago warned about the improper use of statistical significance for addressing issues of economic significance. In statistical terms, significance arises when a characteristic of the population under observation may be taken for real (permanent) or is just attributable to chance variation. To put it differently, the significance level the economist chooses for his analysis is a matter of mathematics or statistics alone and may or may not have any policy relevance at all. It is so to be expected that statistical significance still be treated to be the same as economic significance or what has come to be known as substantive significance (Neyman and Pearson, 1933). According to McCloskey and Ziliak, the topic is still discarded by most leading readings in econometrics and worse still the distinction is not yet considered a topic of interest by several authoritative texts in statistics.

The next two lines of criticism differ in two important aspects from the preceding two. For one thing, they equate the problem of practical significance with the one of theoretical validity. For another, this treatment is much less elaborated and laborious work is still needed in order to validate the analytical treatment of causation in economics.

A third critique tackles the issue of flawed causation among elementary economic variables that virtually sets the scene for the basis of standard micro and macroeconomics. There are disparate observations which speak for serious, fundamental shortcomings of the conventional method of economics. Noteworthy remarks were uttered from the beginning of economic theory by outspoken economists like William Thomas Thornton who insisted that there were no such things as 'laws of supply and demand" (Mirowski 2004, 278) or Oskar Morgenstern who argued that "current theory possesses no methods that allow the

construction of aggregate demand curves when the various constituent individual demand curves are not independent of each other" (Fullbrook 2004, 75). In the same vein, modern economic literature witnesses incongruent discussions on fundamental themes of economic interest (Cojanu 2003).

Finally, a fourth theme of criticism stems from flawed mathematics that is used to quantitatively underpin the economic modeling. From the monumental elaboration of Mirowski (1989) who shows the fatal mistakes in generating the equilibrium conditions to recent observations of outright mathematical errors which persist in economic analysis (Keen 2004) the economist is warned that the economics he is being taught may be not the one which he ought to become familiar with by means of a scientific method proper.

The reader is advised no to take this material as an exercise in refuting mathematical formalism in economics. Instead, its added value should reside in identifying the limits of formalism under those circumstances when the significance of economic analysis either becomes of no practical importance or assumes doubtful theoretical constructions.

Keywords: Formalism; Economic significance; Economic method; Modeling

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THE APPLICATIONS OF TIME SERIES IN THE INSURANCES

Abstract

In paper we analyze data from Annual Reports of Romanian Insurance Supervisory Commission (CSA) and formulate the models based on time series for the predictions regarding the interesting values : the gross written premiums and the gross earned premiums from the life direct insurances and the general direct insurances, the indemnities paid of insurers, the insurance penetration degree, etc. These models can be used for examine the evolution of the surplus process of insurer.

Key words : white noise, autoregressive process (AR), , moving average process (MA), mixed process (ARMA), autoregressive conditional heteroskedasticity (ARCH), generalized ARCH (GARCH), integrated series (ARIMA).

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PARABOLA TANGENT ALGORITHM FOR ONEDIMENSIONAL OPTIMIZATION

Abstract

In the paper an new algorithm for onedimensional optimization is presented.

The algorithm is based on the “tangent parabola” method for solving a class of equations, without divergence points.

Keywords: nonlinear optimization, penalty functions method, multidimensional optimization, one-dimensional optimization

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IMPROVING DECISION-MAKING WITH FUZZY CHOICES BASED ON QUALITATIVE PARTIAL INFORMATION

Abstract

One characteristic of the markets is the asymmetry of information existing between two parties in a transaction. This leads to the market process of adverse selection where “the bad” products or customers are more likely to be selected. Such phenomenon will gradually bring negative impacts at the microeconomic level and more generally, for our society.

In this paper we propose a model of decision making of one buyer and several sellers based on the ranking of alternatives according to fuzzy choices. Here the criteria of choice are derived from the partial information existing in the model. These criteria are represented by fuzzy available sets of alternatives.

Different from other possible solutions, our model tries to correct the adverse selection that appears as the result of asymmetric information between buyers and sellers by interpreting the vectors that contain the partial information (=qualitative) as criteria for the buyers in decision-making.

Keywords: information asymmetry, adverse selection, revealed preference, degree of dominance, fuzzy logic

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MULTIOBJECTIVE FRACTIONAL PROGRAMMING PROBLEMS WITH GENERALIZED INVEXITY

Abstract

Convexity assumptions for multiobjective fractional programming problems of variational type are relaxed to those of generalized invexity assumptions. We define rho-invexity for vector-valued functions. Using the existence of a solution for the multiobjective fractional variational programming problem (Fritz-John-type necessary conditions), we state several weak duality theorems as well as strong duality and converse duality theorem. We consider Wolfe type dual, Mond-Meir type dual and we introduce a symmetric dual which is different from the one proposed by Chen (2000).

The duality theorems are proved under the framework of the generalized rho invexity for vector-valued functions. Some of our results generalize similar results published by Kim, Lee and Schaible (2004).

Keywords: efficient solution (Pareto optimum), weakly efficient solution, proper efficient solution, fractional programming, weak duality, strong duality, converse duality

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ON A PRINCIPLE OF PREMIUM CALCULATION

Abstract

This paper presents the premium calculation principles related to an insurance risk together with the desirable properties that should be satisfied. The main result concerns the iterativity property of the principle of zero utility.

Keywords: premium calculation, zero-utility principle, insurances

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FORECAST OF THE ECONOMIC AGENTS BEHAVIOUR USING THE CHAOTIC MODELS

Abstract

The estimation of the chaotic behaviour is the one of the most provocative theme in the foreseeing of the dynamic systems and on the economic agents' behaviour.

In this paper, we have been introducing a new approach based on the estimation model of the chaotic movement evolution using the instable periodical orbit (IPO) in chaos.

The method has been developed on the base that an initial chaotic movement can be suddenly submissive by an instable periodical orbit (IPO), and seems to be a similar model with the one of IPO. Such movement, similar with the periodical one can persist for a time, but finally it will return to the irregular behaviour, corresponding to the instable nature of IPO.

Kew words: chaotic components, forecast, dynamic systems, instable periodical orbit, periodical movement

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**APLICATIONS OF STATIC GAMES IN CONDITIONS OF INCOMPLETE
INFORMATION**

Abstract

The paper makes a short presentation of static games in conditions of incomplete information and of the equilibrium at that level of games.

In this context, in second part are presented two applications of the Bayes static games like: Cournot duopoly and the negotiation of the salary.

We determine in this way the area of pairs of the variable for the contract that we bargain, representing the aggregate of the Nash Bayes equilibrium points.

Keywords: decision, game, incomplete information, static, Nash Bayes equilibrium

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GRAPH ATTRACTORS

Abstract

This paper aims to present a series of particularly aspects concerning the optimal path in some case, in order to deal very fast with this, when the graph contain a particular subgraph, named attractor and we need many solutions in a very short time.

Keywords: graph, subgraph, optimal path, attractor.

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A GRAPH-METHOD IN ACTIVITIES EVALUATION

Abstract

This paper aims to present a new activities evaluation method based on critical path in graphs and specific optimal criteria, the score of well activities done resulting from the “distance” between the optimal path and the accomplished one.

Keywords: graph, optimal, optimal path, deviation, deviation measure.

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ECONOMIES AS OBJECTS

Abstract

This paper discusses the relatively new idea of numerical modeling economic systems by means of object oriented programming. We define the most important notions from object oriented programming and give several examples of class structures for key economical concepts. The primary purpose is to illustrate the flexibility of this approach for organizing and describing the structure and functional properties of complex economic models.

Keywords: *Economies, Object Oriented Programming, General Equilibrium.*

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SOME GENERAL PROBLEMS OF OPTIMIZATION

Abstract

The paper outlines some of the general methods of optimization and some of the differences between the theoretical approaches, the techniques' bundle of catching the most adequate candidate of solutions and the practical approach from the real world of a problem of optimization. All these remarks are made for build a general optimization frame.

Keywords: methods of optimization, resolution, general optimization frame.

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A STEP TOWARDS A STANDARD IN THE HIGHER EDUCATION

Abstract

The permanent change of the targets and the absence of a visionary thinking put their fingerprints on the instructive-educational activity in Romania during the transition period to a market economy. The outcomes are visible only on long-term, while through consequences the effects may be devastating in some cases. Within this context, by starting from the needs of the Romanian society, building up a benchmark suitable to requirements is a need, beyond the required complexity of the approach and the difficulties of its materialization.

The paper outlines a package of skills that map the capabilities of an expert in dealing with conflict situations. The package may be transformed into a systematic plan for developing these skills and may be integrated in a specific way within the syllabuses of the three preparatory cycles of higher education. The step is part of the European Union sustained efforts made in order to enhance the quality and efficiency of all activities.

Keywords: standard, higher education, skills, expert in conflicts problems.

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THE USE OF KALMAN FILTER IN THE MACROECONOMIC ANALYSIS

Abstract

In the first part of our paper we provide a brief discussion of the Kalman filter in the general case and the particular one dimensional case. The succeeding parts comprise the application of Kalman filter for some relevant macroeconomic fields: inflation, monetary policies, employment-output correlation, and evolution of the credibility from the response of the commodity prices.

Keywords: inflation, Kalman filter, employment, monetary policies, Pontreghin Principle, credibility,