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PROGRAMAREA STOCASTICĂ CU MAI MULTE FUNCȚII OBIECTIV

*(Stochastic Programming with Several Objective Functions)*

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A recent field appearing out of practical necessity is that of mathematical programming with several objective functions, also called vectorial programming. The problem resides in optimizing several objective functions (some of them having to be maximized and others minimized) provided the variables verify a system of linear or nonlinear constraints. The solving of these problems raises difficulties to the efect that an optimal solution according to a function is not optimal for the other functions too, sometimes being very disadvantageous.

The stochastic case of mathematical programming with several objective functions is studied and developed by the author in the paper "Stochastic Programming with Several Objective Functions" printed by the Publishing House of the Academy of the Socialist Republic of Romania, Bucharest, 1980, the first book on this subject in the world mathematical literature.

The book divided into seven chapters is a synthesis of the author's studies in the field of stochastic programming with several objective functions, studies resulting from over ten years of assiduous work, appreciated in the country and abroad, published in various articles and in his doctor's degree paper.

Upon reading the book, we note the trends in this highly topical domain in economic practice, with many practical applications, the present stage of its development, the difficulties in solving the problem, the numerical methods of effective solution.

The first two chapters have an introductive character in which the author is filtering and systematizing the main results known in the field of deterministic vectorial programming and of stochastic programming with a single objective function.

The study of stochastic programming with several objective functions begins in the third chapter and the results known in connection with explicite formulas are extended for the function of optimum allocation for linear programs with cost coefficients, related functions of a single random variable, in connection with the stochastic Cebîșev programming with several objective functions and the stochastic fractional programming in which the functionals intervening in the objective function depend on a single random variable. Other problems tackled in this chapter refer to efficient solutions, group decisions, solutions with a minimal risk, stochastic programming with two deterministic

objective functions (the mean and dispersion), the objective programming, the PROTRADE method, a.s.o.

Generalizations of Kataoka's problem in which the determination of the optimal value of the objective function is asked so that the probablity of obtaining such a result should exceed a certain given threshold and of the minimal risk problem are developed by the author in the fourth chapter. The generalizations refer to replacing the linear functionals by random coefficients by product and by linear functionals. The deterministic equivalences of the two problems and the two solving methods are noticed.

The fifth chapter is devoted to solving a more general case of a minimal risk problem, namely when the possibilities are maximized for the values of the objective functions to exceed certain given thresholds. The problem is solved with a sequential method of solving usual problems of minimal risk. The author introduces an interesting model, the problem with a multiple minimal risk whose solution is obtained by a relaxation method of nonlinear constraints.

Chapter sixth studies the transport problem with several objective functions, such as: transport expenses, the total time ncessary for goods transport and the volume of transported goods. The solving methods both in the deterministic and stochastic cases are generalizations of previous results scored by other authors.

The last chapter presents a number of applications to mixture and loading problems, the working out of the production plan of an enterprise by taking into account several efficiency criteria. The author has used the methods of mathematical programming with several objective functions to solve problems appearing within cooperation contracts.

Thus, it results that the work is a harmonious blending of theoretical research with the applications in economic practice, being part of the process of integrating education into research and production.

The book comprises a selective reference material of the large number of works existing in this field.

In conclusion, the book represents a valuable theoretical and practical contribution of the author to the development and improvement of the solving methods of mathematical programming problems with several objective functions, a contribution which is added to and completes the world results obtained so far by the Romanian school of mathematics in mathematical programming.

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