Scientific Report on the implementation of the project "Portfolio Selection Models and Applications" 2012

The objective of the project for the year 2012 is:

Decision making models for sustainable development based on portfolio theory and loss function theory.

The sub-objectives are:

a) Establishing the innovative hypothesis for the mathematical models
b) Formulation of models, objectives and constraints
c) Designing algorithms for solving the models
d) Elaboration of decision support software
e) Numerical analysis of the performance
f) Sensitivity analysis

The expected results to be obtained for the objectives are: minimum two published / accepted paper in ISI indexed journals and a research report.

The expected results to be obtained for all sub-objectives (a)-(f) are present in papers [1] and [2].
The expected results to be obtained for sub-objectives (a)-(c) and (f) are present in the papers [3] and [4] and in the talks [C01]-[C09].

In the paper [1] a software tool for minimizing the risk of investment in agriculture was presented. The software is intended for decision support in the crop planning. It is based on financial portfolio theory. After the formulation of the models, objectives and constraints some algorithms are designed for solving the models. Ranges for the user parameters were determined. Several numerical results were studied. Numerical analysis of the performance of the software tool and the models sensitivity was analyzed. In the paper [2] have been formulated several models based on portfolio theory for planning crops if there are some constraints related to environmental protection . The models aim to solve the tradeoff between economic goals and those of reducing application of fertilizers and pesticides. Several numerical results were analyzed. Sensitivity analysis of the models was performed.

In the paper [3] an integrated portfolio selection method with risk estimation and optimization in the mean-risk framework is developed. The algorithm proposed follows three steps. The first one, stock selection, uses Principal Component Analysis (PCA) and clustering techniques to build classes of similar assets. In the second, Value-at-Risk measure (VaR) is used to evaluate risk and the asset with minimal VaR is selected from each class. In the third step the assets selected previously are used to build the optimal portfolio, solving a mean-VaR optimization problem. The original contribution presented in the paper stands in combining classification theory with risk estimation and optimization techniques based on VaR risk measure. The optimization process starts with an initial portfolio composed by a wide range of assets with minimal risk. This method is used to build an optimal portfolio of assets and to derive the efficient frontier.

In [4] a LR fuzzy possibilistic portfolio selection model was proposed. The model is of Mean – VaR type and contains a special class of fuzzy numbers. An algorithm for solving the model is proposed. The algorithm is then applied to a numerical example in order to illustrate the potential applications of the new model.
Paper [5] is a research report that includes a survey on decision making models for sustainable development based on portfolio theory and loss function theory.
A survey on the application of portfolio theory to sustainable development has been made in the talk [C09]. In the talk were presented several models of sustainable development from industry and agriculture. The models belong are planning models with constraints related to environmental protection. The ideas underlying these models are inspired from the theory of financial investments. The role of financial assets is played here by various industrial products manufactured or by crops. The considered models are in continuous variable and discrete variable.
In the talk [C02] several optimization models for aquaculture planning were presented. All the models were based on portfolio theory. Models constraints are related to budgets farms and the minimum quantities of fish of each species to be collected.
All the targets of the research project were successfully met in the 2012 stage.
Tasks to disseminate the results obtained in the 2012 stage have been met. The results were disseminated in the talks given at prestigious scientific conferences.
The expected results to be obtained were published in ISI indexed journals and in international conferences proceedings. A research report on the subject connected with the second objective of the project was elaborated.

Papers published in international journals (ISI indexed)

[1] Rădulescu C.Z., Rădulescu M., A decision support tool based on a portfolio selection model for crop planning under risk, Studies in Informatics and Control, Vol. 21, No. 4, (2012), 377-382. (2011 impact factor 0.578)

[2] Rădulescu M., Rădulescu C.Z., Zbaganu Gh., A portfolio theory approach to crop planning under environmental constraints, Annals of Operations Research, DOI: 10.1007/s10479-011-0902-7. (online). (2012 impact factor 1.029)

Papers published in Proceedings of international conferences

[3] Fulga C., Dedu S., Mean-risk portfolio optimization with prior PCA-based stock selection, International Workshop "Stochastic Programming for Implementation and Advanced Applications" (STOPROG-2012) July 3–6, 2012, Neringa, Lithuania, Editors: L. Sakalauskas, A. Tomasgard, S. W.Wallace, Proceedings. Vilnius, 2012, pp. 37–42. ISBN 978-609-95241-4-6, doi:10.5200/stoprog.2012.07 http://www.moksloperiodika.lt/STOPROG_2012/contents.html

Papers accepted for publication at ISI indexed journals

[4] Fulga C., Popescu C. C., Possibilistic portfolio optimization with LR(1/2) -piecewise linear fuzzy parameters, RAIRO Operations Research, pg 1-15. (2012 impact factor 0.237), Relative Influence Score: 0.378.

[5] Rădulescu M., Decision making models for sustainable development, Research Report, October 2012.

Dissemination of the results in prestigious conferences in the field

Talks given at the national conferences

[C01] Radulescu M., Radulescu S., Radulescu C. Z., Mean-variance models with complementarity constraints, A 15-a CONFERINȚĂ a SOCIETĂȚII de PROBABILITĂȚI si STATISTICĂ, Bucuresti 2012.

Talks given at international conferences

[C02] Radulescu M., Radulescu C. Z., Radulescu S., Applications of portfolio theory to production planning for fish farms, EURO XXV Conference, 2012.

[C03] Fulga C., Portfolio optimization with a new quantile-based risk measure, Paper presented in the session: Financial Modeling and Optimization, EURO XXV Conference, 2012.

[C04] Zbaganu Gh., Absolutely optimal portfolios, EURO XXV Conference, 2012.

[C05] Fulga C., Dedu S., Mean-risk portfolio optimization with prior PCA-based stock selection International Workshop "Stochastic Programming for Implementation and Advanced Applications" (STOPROG-2012), 2012

[C06] Radulescu M., Radulescu S., Radulescu C. Z., The efficient frontiers of mean – variance portfolio selection problems, 21st International Symposium on Mathematical Programming (ISMP 2012), 2012.

[C07] Radulescu M., Radulescu S., Radulescu C. Z., Portfolio selection models with complementarity constraints, 21st International Symposium on Mathematical Programming (ISMP 2012), 2012.

[C08] Fulga C., Higher moments and conditional value at risk optimization, 21st International Symposium on Mathematical Programming (ISMP 2012), 2012.

[C09] Radulescu M., Radulescu C. Z., Portfolio selection models and sustainable development, International Confererence on Operations Research (OR 2012), 2012.

Positions of team grant members in organization of international conferences

Name of team member: Fulga Cristinca
Name of the international conference: EURO XXV Conference, 2012.
Position: Stream organizer (Stream with 5 sessions)
Name of the stream: Decision Making Modeling and Risk Assessment in the Financial Sector

Name of team member: Radulescu Marius
Name of the international conference: EURO XXV Conference, 2012.
Position: Chair of the session: Portfolio Decision Analysis

Name of team member: Radulescu Marius
Name of the international conference: 21st International Symposium on Mathematical Programming (ISMP 2012), 2012.
Position: Chair of the session: Portfolio Selection Problems

Project Director
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Senior research worker