Financial Engineering Laboratory

by

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Financial Engineering Laboratory

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The Financial Engineering Laboratory was founded in 1999 after decision of the Greek Ministry of Education. Its objective is to provide high-level educational support to under-graduate and graduate students of the Department of Production Engineering and Management of the Technical University of Crete, as well as to conduct high-level scientific research on the field of financial engineering and management.

From the methodological point of view, the research conducted by members of the Financial Engineering Laboratory involves both theoretical developments and applications in financial engineering, of advanced operations research techniques (multicriteria decision aid, optimization), artificial intelligence tools (expert systems, fuzzy sets, neural networks), as well as the design and implementation of decision support systems for financial engineering problems. The tools that have already been developed by the members of the laboratory have been applied successfully on several fields of financial engineering and management, including but not limited to:

- *Corporate performance.*
- *Assessment of bankruptcy and credit risk.*
- *Financial planning.*
- *Corporate mergers and acquisitions.*
- *Venture capital investments.*
- *Portfolio selection and management.*
- *Credit cards evaluation.*
- *Assessment of the efficiency of bank branches.*
- *Country risk evaluation and the impact of exchange rates on corporate performance.*
- *Efficiency of small business enterprises.*

In addressing these problems, the members of the laboratory have developed three decision support systems that implement sophisticated multicriteria decision aid methods based on the preference disaggregation approach. These systems include:

1. The FINCLAS system: The FINCLAS system (Zopounidis and Doumpos, 1998) is a multicriteria decision support system developed to study financial decision making problems in which a classification (sorting) of the alternatives is required. The present form of the system is devoted to corporate credit risk assessment, and it can be used to develop classification models to assign a set of firms into predefined credit risk classes. The Ionian Bank of Greece, the Commercial Bank of Greece, the General Bank of Greece and the Bank of Greece are currently using the FINCLAS system in their daily practice regarding the assessment and monitoring of corporate performance and viability. Furthermore, the University of Macedonia, the Athens University of Business and Economics and the

Technological and Educational Institute of Crete, also use the FINCLAS system for educational purposes with regard to the financial analysis and the contribution of MCDA in this field.

2. The INVESTOR system: The INVESTOR system (Zopounidis and Doumpos, 1999a) is developed to study problems related to portfolio selection and management. The system implements preference disaggregation analysis techniques as well as goal programming to support portfolio managers and investors in their daily practice.
3. The PREFDIS system: The PREFDIS system (Zopounidis and Doumpos, 2000) is a multicriteria decision support system developed to address classification problems. The system implements a series of preference disaggregation analysis techniques, namely the family of the UTADIS methods, in order to develop an additive utility function to be used for classification purposes.

Except for the above decision support systems, the Laboratory is equipped with several statistical, econometric and optimization software packages (SPSS, LIMDEP, MATLAB) that can be used to model and address complex financial engineering problems.

The research and educational activities of the Laboratory have been funded by several grants obtained from the European Union, the Greek Government, and private companies.

At moment, the members of the laboratory include:

- Professor Constantin Zopounidis (Director)
- Associate Professor George Kouretas
- Lecturer Augustinos Dimitras
- Adjunct Professor Michael Michalopoulos
- Dr. Michael Doumpos
- Kiki Kosmidou, PhD candidate
- Konstantina Pentaraki, PhD candidate
- Maria Bakatsaki, PhD candidate
- Michael Spanos, PhD candidate
- Panagiotis Antonakakis, PhD candidate

Furthermore, these is a number of post-graduate students and under-graduate students who are working in the Laboratory.

The laboratory is equipped with nine PCs (three Pentium III/600Mhz, three Pentium II/450Mhz, one Pentium Pro/200Mhz, one Pentium 200Mhz, one Pentium 100Mhz), four laser printers (one network printer), one inkjet printer, a scanner, and a photocopy machine.

Furthermore, the Financial Engineering Laboratory has recently initiated a working paper series in order to provide a mean of communication on financial engineering and multicriteria decision aid topics. This series includes monographs and articles by members of the laboratory as well as papers of joint projects conducted by visiting scholars in cooperation with members of the laboratory. The topics covered by the working paper series involve any aspect of financial engineering and financial risk management, including the aforementioned list of issues and other topics related to financial derivatives, investment and commercial banking, trading, hedging strategies, corporate finance, portfolio management, risk management, financial planning, asset/liability management, etc. All articles submitted for publication in this working paper series are refereed by an external reviewer for evaluation and discussion with the authors. Articles appearing in the series may subsequently be submitted for publication to international journals. Those interested in submitting an article for publication in the working paper series of the Financial Engineering Laboratory should contact the Editor of the series, Prof. Constantin Zopounidis, at the following address:

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Further information on the activities of the Laboratory are available at the website:

http://www.dpem.tuc.gr/fel/

Selected Publications

Books

Zanakis, S.H., Doukidis, G. and Zopounidis, C. (2000), *Decision Making: Recent Developments and Worldwide Applications*, Kluwer Academic Publishers, Dordrecht.

Zopounidis, C. and Doumpos, M. (2000), *Intelligent Decision Aiding Systems Based on Multiple Criteria for Financial Engineering*, Kluwer Academic Publishers, Dordrecht.

Zopounidis, C. and Dimitras, A.I. (1998), *Multicriteria Decision Aid Methods for the Prediction of Business Failure*, Kluwer Academic Publishers, Dordrecht.

Zopounidis, C. (1998), *Operational Tools in the Management of Financial Risks*, Kluwer Academic Publishers, Dordrecht.

Zopounidis, C. (1997), *New Operational Approaches for Financial Modeling*, Physica-Verlag, Berlin-Heidelberg.

Hurson, Ch. and Zopounidis, C. (1997), *Gestion de Portefeuille et Analyse Multicritère* , Economica, Paris.

Refereed Journals

Doumpos, M. and Zopounidis, C. (2000), "Assessing financial risks using a multicriteria sorting procedure: The case of country risk assessment", *Omega*, vol. 29, no. 1, 97-109.

Doumpos, M., Zopounidis, C. and Pardalos, P.M. (2000), "Multicriteria sorting methodology: Application to financial decision problems", *Parallel Algorithms and Applications*, vol. 15, no 1-2, 113-129.

Doumpos, M., Zopounidis, C. and Anastassiou, Th. (2000), "A hierarchical discrimination method based on multiple criteria for the assessment of financial risks", *Gestion 2000, Belgian Management Magazine* 15(1), 147-157.

Zopounidis, C. and Doumpos, M. (2000), "PREFDIS: A multicriteria decision support system for sorting decision problems", *Computers and Operations Research*, vol. 27, no. 7-8, 779-797.

Zopounidis, C. and Doumpos, M. (1999a), "Investor: A decision support system based on multiple criteria for portfolio selection and composition", in: Roy, B., Bouyssou, D., Tsoukias, A. and Vanderpooten, D. (Eds.), *Programme and Abstracts of the 50th Meeting of the European Working Group «Multicriteria Aid for Decisions»*, 81-87.

Zopounidis, C. and Doumpos, ?. (1999b), ìBusiness failure prediction using the UTADIS multicriteria analysis method", *Journal of the Operational Research Society* 50(11), 1138-1148.

Zopounidis, C. and Doumpos, M. (1999c), "A multicriteria decision aid methodology for sorting decision problems: The case of financial distress", *Computational Economics* 14(3), 197-218.

Zopounidis, C., Doumpos, M. and Zanakis, S.H. (1999), "Stock evaluation using a preference disaggregation methodology", *Decision Sciences* 30(2), 313-336.

Dimitras, A.I., Slowinski, R., Susmaga, R. and Zopounidis, C. (1999), "Business failure prediction using rough sets", *European Journal of Operational Research* 114(2), 263-280.

?opounidis, C. (1999), ìMulticriteria decision aid in financial managementî, *European Journal of Operational Research 119(2), 404-415.*

Zopounidis, C. and Doumpos, M. (1998), "Developing a multicriteria decision support system for financial classification problems: The FINCLAS system", Optimization Methods and Software 8, 277-304.

Doumpos, M. and Zopounidis, C. (1998), "The use of the preference disaggregation analysis in the assessment of financial risks", Fuzzy Economic Review 3(1), 39-57.

Slowinski, R., Zopounidis, C. and Dimitras, A.I. (1997), "Prediction of company acquisition in Greece by means of the rough set approach", European Journal of Operational Research 100(1), 1-15.