Scientific Workshop and Seminar Series to the Memory of Professor Jürgen Lehn

Report about
Workshop on Recent Developments in Applied Probability and Statistics
April 23-24, 2009
and the *Pre-Workshop Seminar Series*
"Asset Liability Models for Life Insurances"
April 22, 2009

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Professor Dr. Jürgen Lehn passed away on September 29, 2008, at the age of 67. In him, the Department of Mathematics and the Institute of Applied Mathematics (IAM) at Middle East Technical University (METU), and his Department of Mathematics at Darmstadt University of Technology (TUD) lost a valuable colleague and a good friend.

Prof. Jürgen Lehn supervised many theses, he was author of numerous articles and books, and editor of proceedings volumes and journals. Some of the most important institutions of German scientific society are associated with the name of Prof. Jürgen Lehn**:** German Science Foundation where he was a peer reviewer, German Mathematical Association where he held various leading positions, Probability and Statistics Group and, especially, the celebrated Mathematical Science Institute of Oberwolfach where he was a leading scientist and treasurer.

Workshop on Recent Developments in Applied Probability and Statistics
Dates: April 23-24, 2009
Place: Arf Lecture Hall, Department of Mathematics, METU

   G. Ikeda Seminar Room, Department of Mathematics, METU

http://www3.iam.metu.edu.tr/juergenlehn/

IAM and Department of Mathematics of TUD have conducted the special workshop *"Workshop on Recent Developments in Applied Probability and Statistics"* to the memory of Professor Jürgen Lehn. This workshop ucceeded the Pre-Workshop Seminar Series *"Asset Liability Models for Life Insurances"*. Both the main workshop and its satellite event before can be regarded as a joint and premium event. (Please visit Appendix I for closer information about the pre-workshop seminar series.)

IAM shared moments of science and friendship in Professor Lehn's honour, in areas of applied mathematics which he worked in as a researcher, educator and scientific pioneer. The workshop followed the aforementioned series of seminars for practitioners from the financial

sector, mainly, from Turkey, and for the students. Its program aimed to represent various subjects constituting the title of the event. Talks focussed on the progress made in Applied Probability and Statistics, in theory, numerical and simulation methods, and applications ranging from finance, biology and medicine, inverse problem in engineering to cryptography. In many countries, especially, in developing economies, the aforementioned methods are not yet well introduced and implemented, personelle not yet well trained, and statistical data are insufficient. This creates both decision making problems under uncertainty and model risks and various areas of professional and daily practice. Our workshop and its satellite series of seminars served as and contributed to a platform in research and education to overcome these drawbacks and their scientific problems related.

The scientific goals of the workshop consisted in sharing and discussing recent excellent research achievements, in preparing future projects on modern challenges in science and development of the financial sector, and is an invitation to the youth into this dynamics, with a special emphasis on guiding it. The workshop program consisted of keynote lectures, invited and contributed presentations. It was attended by about 85 participants.

Topics were Stochastic Differential Equations, Stock Price Processes Pricing of Options, Interest Rate Models, Credit Derivatives, Short Rate Models, Risk Management,Portfolio Optimization, Measure and Probability Theory and Theory of Distributions,Time Series and Stochastic Processes, Partial Differential Equations in Finance and Related Areas,Numerical Solution of Stochastic Differential Equations,Monte Carlo Methods in Finance and further Applications, Mathematics of Life Insurance, Optimization Theory and Methods in the Financial and Actuarial Sectors, Pseudo Random Numbers and Their Generators, Fibonacii Numbers and Applied Number Theory, Probability and Statistics in Cryptology, Testing Theory, Regression Theory, Classification Theory, Bayesian and Non-Bayesian Methods, Imbalanced Data and Outliers, Probabilistic and Statistical Methods in the Industry, Statistical Applications in Finance and the Energy Sector, Statistical Applications in Medicine, Stochastic Programming and Its Applications,Statistical Design of Experiments,Genetic Association Studies, Reliability Analysis, Quality Analysis and Management in the Industry and the Service Sector, Fuzzy Logic and Its Applications. Experts from Turkey and all over the world served for this introduction and state-of-the-art presentation of exciting and very important themes. Among these distinguished scholars were also numerous former colleagues and students of Professor Lehn and, in particular, our keynote and invited speakers.

The talks of the workshop presented various recent developments in applied probability and statistics. The scientific goal of the workshop constisted in sharing and discussing recent excellent research achievements in those important areas, in preparing future projects on modern challenges in these sectors, and in an invitation of the youth to join this dynamics.

Among the 34 talks, there are 2 keynote lectures and 10 invited lectures. Furthermore, the program includes a panel discussion on the Impact of Mathematics in Science, Technology and Economics. The workshop was preceded with a Seminar Series on Asset Liability Models for Life Insurances.

Keynote Speakers:

> o Luc De Vroye (School of Computer Science, McGill University, Montreal, Canada):
>   *"Random Number Generation - one of Jürgen Lehn's Passions"*

o   Ralf Korn (Department of Mathematics, University of Kaiserslautern, Germany):
    "Decoupling Approach to Binomial Pricing of Multi-Asset Options"

Invited Speakers:

o   Katja Ickstadt (Department of Statistics, TU Dortmund University, Germany):
    *"Penalty Specialists Among Goalkeepers: A Nonparametric Bayesian Analysis of the
    German Bundesliga"*

o   Roland Fried (Department of Statistics, TU Dortmund University, Germany):
    "Outliers and Interventions in Time Series of Counts"

o   Michael Kohler (Department of Mathematics, TUD, Darmstadt, Germany):
    "Regression-based Monte Carlo Methods for Pricing American Options"

o   Dominique Küpper (Department of Mathematics, TUD, Darmstadt, Germany):
    "Runge-Kutta Methods for Stochastic Differential-Algebraic Equations"

o   Volker Mammitzsch (Department of Mathematics and Computer Science, Philipp
    University, Marburg, Germany): *"Bayesian or Non-Bayesian: A Short Note"*

o   Angelika May (Institute for Mathematics, Carl von Ossietzky University Oldenburg,
    Germany): *"Old and New on Stochastic Interest Rate Modeling"*

o   Thomas Müller-Gronbach (Chair of Mathematical Stochastics, University of Passau,
    Germany): *"Nonuniform versus Uniform Discretization for Stochastic Heat
    Equations"*

o   Klaus Ritter (Department of Mathematics, TUD, Darmstadt, Germany):
    "Multi-level Algorithms and Approximations of Distributions"

o   Andreas Rössler (Department of Mathematics, TUD, Darmstadt, Germany):
    *"Mean-Square Stability Analysis of Weak Approximation Methods for Stochastic
    Differential Equations"*

o   Alev Topuzoğlu (Faculty of Engineering and Natural Sciences, Sabancı University,
    Istanbul, Turkey): *"On the Inversive Pseudorandom Number Generator"*

Programme Committee:

*   Ömer Gebizlioğlu (Dept. Statistics, Ankara University, State Institute of Statistics,
    and IAM, METU, Ankara, Turkey),

*   Michael Kohler (Department of Mathematics, TUD, Darmstadt, Germany),

*   Klaus Ritter (Department of Mathematics, TUD, Darmstadt, Germany),

*   Gerhard-Wilhelm Weber (IAM, METU, Ankara, Turkey)

Organizing Committee:

*   Şafak Alpay (Department of Mathematics, METU, Ankara, Turkey),

*   Zeynep Kalaylıoğlu (Department of Statistics, METU, Ankara, Turkey),

- Bülent Karasözen (IAM and Department of Mathematics, METU, Ankara, Turkey),

- Michael Kohler (Department of Mathematics, TUD, Darmstadt, Germany),

- Sevtap Selçuk-Kestel (University of Freiburg, Germany, and IAM, METU, Ankara, Turkey),

- Gerhard-Wilhelm Weber   (IAM, METU, Ankara, Turkey).

Coorganizing Institutions and Sponsors:

- Institute of Applied Mathematics, METU,

- Middle East Technical University (METU),

- Department of Mathematics, TUD,

- Darmstadt University of Technology (TUD),

- TÜBİTAK - The Scientific and Technological Research Council of Turkey,

- Central Bank of the Republic of Turkey,

- Mathematics Foundation of Turkey.

The main workshop and entire double event and their entire organizational care were very much scientifically appreciated, and hospitality and community were really enjoyed by the participants. This became expressed by many participants during the workshop and seminar series, and by various e-mails after those days.

Besides the excellent scientific program, the solemn opening ceremony and the conference dinner belonged to the central and important times shared.

Another speciality of the workshop consisted in the

Panel Discussion: *Impact of Mathematics in Science, Technology and Economics*

with is discussants Michael Schaefer (Department for Numerical Methods in Mechanical Engineering, TU Darmstadt, Germany): *"Computational Science and Engineering Programs in Germany"*, Ralf Korn (Department of Mathematics, University of Kaiserslautern, Germany): *"Financial Mathematics: Between Stochastic Differential Equations and Credit Crisis",* and Bülent Karasözen (IAM and Department of Mathematics, METU, Ankara, Turkey): *"Scientific Computing"*.

We would also like to point out there has been an

Alumni Meeting of the Alumi Club of Darmstadt University of Technology (TUD)

in the wider programme of the workshop days in Ankara. This additional event made the historically excellent relations between TUD, which is one of the leading Institutes of Technology in Germany, and METU and, herewith, all of Turkey, even closer and prepared the way for closer relations and scientific collaboration in future.

Among the *gains and successes* of these days of excellent science and community, there were, in particular:

- o chances for young scientists from Turkey to become introduced at the international stage, as represented by both workshop events and the guests from all over the world present, by presentations given, organization of scientific life learned and conversations participated by the young people,

- o an intensified contact and collaboration among various units of METU, in particular, IAM, Department of Mathematics, Department of Statistics, and other departments, and with other universities in Turkey and in abroad,

- o activation of interest in the areas of applied probability, statistics, financial mathematics and stochastic calculus among teachers and students likewise;

- o colleagues from Turkey and other countries met and started to prepare common projects and create networks, for example,

  - projects on joint supervision of students from IAM of METU by teachers from IAM and foreign experts,
  - young Turkish people find opportunities to go abroad for scientific stays,
  - creation of a research network on applied probability, statistics, financial mathematics and stochastic calculus, in Turkey,

- o recontact with the Turkish financial sector as expressed by banks and insurance companies,

- o scientific education and impulses given to representatives and coworkers of Turkish banks and insurance companies,

- o introduction of and emphasis put on TÜBITAK as an institution of excellence, of generousity and giving chances to make premium events become true.

The organizers would like to express their cordial thanks to TÜBİTAK - The Scientific and Technological Research Council of Turkey - for its kind interest and generous support of the scientific double-event celebrated at METU, Ankara, in April 2009.

Cordial gratitude to the precious sponsors and *all* those friends who served in making our two scientific events to the memory of Professor Jürgen Lehn a success and, as the organizers hope, a contribution to collaboration, friendship and development in the areas of applied probability and statistics, in Europe and the world!

Ankara, May 4, 2009

Appendix :

"Asset Liability Models for Life Insurances"
Series of Seminars

Institute of Applied Mathematics at METU, Ankara, Turkey, conducted a two-days workshop given by

Prof. Dr. Angelika May
(Carl von Ossietzky University of Oldenburg, Germany)

Date: **April 22, 2009**
Place: **Hall D, Cultural and Convention Center, METU**

Abstract

Asset Liability Management (ALM) is based on a simultaneous modelling for both the asset and the liability side. The goal of ALM consists in providing the decision makers with a quantitative basis of information and, by this, to contribute to the corporate management. That always necessitates forecasts into the future, either by calculating a prognosis (deterministic model) or by stochastic scenarios. Another goal consists in computing a (fair) value of the liabilities and the assets at market price, in order to calculate the solvency capital and other quantities which are already partially requested in the EU by regulations for the boards of management. The requirements for a model of the capital market for life insurances will be formulated. For the benchmark asset classes of stocks, of assets with fixed interest rates and of real estates, examples of models from practice and from research in the fields of actuarial mathematics will be presented. Traditionally, liabilities are modelled in a deterministic way. There are also new approaches based on time series prepared in order to allow a more flexible treatment of midterm changes, e.g., of biometrical data. With the help of a model that was recommended in Germany by the regulation authority it will be shown, how the practical realization can be elaborated. This will especially include the areas of stress test and back test. Parallel to the building of the model, we will make considerations about different risk measures.