



Institute of Applied Mathematics
METU, Ankara, Turkey

Scientific Workshops in Honour of Professor Hayri Körezlioğlu

Report about

Workshop “Recent Developments in Financial Mathematics and Stochastic Calculus”

April 25-26, 2008

and the *Pre-Workshop Seminar Series*

Workshop “The Simulation Tool Box for the Financial Engineer”

April 23-24, 2008

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On June 26, 2007, our dear teacher and friend Prof. Dr. Hayri Körezlioğlu passed away at the age of 77. Professor Körezlioğlu was the founder and chair of the Department of Financial Mathematics at the Institute of Applied Mathematics (IAM) of the Middle East Technical University (METU). This institute, established in 2002, is the first of its kind in Turkey; it contains three modern departments (please visit <http://www3.iam.metu.edu.tr/>). That Prof. Dr. Hayri Körezlioğlu is no longer among us means a great loss for everyone at IAM.

Workshop “Recent Developments in Financial Mathematics and Stochastic Calculus”

Dates: April 25-26, 2008

Places: Cultural and Convention Center (CCC) and Department of Mathematics, METU

<http://korezlioglu.iam.metu.edu.tr/>

IAM has conducted the special workshop “*Workshop on Recent Developments in Financial Mathematics and Stochastic Calculus*” in memory of Professor Hayri Körezlioğlu. This workshop succeeded the Pre-Workshop Seminar Series “*The Simulation Tool Box for the Financial Engineer*”. 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 Körezlioğlu’s honour, in areas of applied mathematics which he worked in as a researcher, educator and as a pioneer in Turkey. 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 Financial Mathematics for modeling financial phenomena and developing numerical techniques for applications. An additional emphasis was made on the theoretical foundations in Stochastic Calculus. Concerning applications, a major problem is model identification based on observations. In many countries, especially, in developing economies, statistical data are insufficient. This creates both decision making problems under uncertainty and model risks.

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 tutorials, invited and contributed papers.

Topics became overviewed, trends and recent achievement became presented on themes such as option pricing, hedging of claims, interest rate models, market risk, credit risk and credit rating, computational statistics and statistical learning for model identification, inverse problems in finance, modeling and solution of random phenomena as Brownian motions, Levy processes in modeling financial instruments, functional central limit theorems for semimartingales, modelling asymmetric or imperfect dynamical information, rare events and risk management, optimal portfolio management, stochastic optimal control in finance, dependence issue in finance, optimal stopping, large-scale optimization techniques in finance, numerical methods in finance, software development, applications of theory and methods to the financial sector of Turkey, theoretical advances in stochastic processes and time-series models. 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 Körezlioğlu and, in particular, our invited speakers.

Invited Speakers:

- *Erhan Bayraktar* (University of Michigan, Ann Arbor, USA):
“*On the Pricing of Asian Options for Jump Diffusions*”,
- *Uluğ Capar* (Sabanci University, Istanbul, Turkey):
“*An Excursion in Wiener and White-Noise Space Distributions with Emphasis on Körezlioğlu-Üstünel Distributions*”,
- *Monique Jeanblanc* (Université d’Evry, France):
“*Initial Times and Dynamic Modelling of Successive Defaults*”,
- *Ralf Korn* (University of Kaiserslautern, Germany):
“*Are Modern Portfolio Optimization Methods Really Applicable?*”,
- *Wolfgang J. Runggaldier* (Universita degli Studi di Padova, Italy):
“*Stochastic Dynamic Optimization Problems in Finance when Information is Incomplete*”,
- *Deniz Sezer* (York University, Canada):
“*Information Reduction by Level Crossings in a Credit Risk Model*”,
- *Halil Mete Soner* (Sabanci University, Istanbul, Turkey):
“*Pricing in an Il-liquid Market*”,
- *Süleyman Üstünel* (Ecole Nationale Supérieure des Telecommunications, Paris, France):
“*Measure Transportation on Wiener Space and Applications*”.

Program Committee:

- Ralf Korn (Department of Mathematics, Technical University of Kaiserslautern, Germany),
- Bernt Oksendal (Department of Mathematics, Oslo University, Norway),
- Wolfgang J. Runggaldier (Department of Pure and Applied Mathematics, University of Padova, Italy),
- Mete Soner (Faculty of Management, Sabanci University, Istanbul, Turkey),
- Gerhard-Wilhelm Weber (Institute of Applied Mathematics, Middle East Technical University, Turkey).

Organizing Committee:

- İnci Batmaz (Dept. of Statistics; IAM, METU, Ankara, Turkey),
- Azize Hayfavi (IAM, METU, Ankara, Turkey),
- Jale Körezlioğlu (President's Office, METU, Ankara, Turkey),
- Devin Ali Sezer (IAM, METU, Ankara, Turkey),
- Ömür Uğur (IAM, METU, Ankara, Turkey),
- Gerhard-Wilhelm Weber (IAM, METU, Ankara, Turkey; chair),
- Kasirga Yıldırak (IAM, METU, Ankara; Trakya University, Turkey);
- Assistant to the Committee: Zehra Eksi (Financial and Actuarial Mathematics, Vienna University of Technology, Austria).

Coorganizing Institutions and Sponsors:

- Institute of Applied Mathematics, METU, Ankara, Turkey,
- Middle East Technical University (METU), Ankara, Turkey,
- Department of Mathematics, METU, Ankara, Turkey,
- European Science Foundation (ESF),
- "Applied Mathematical Methods for Finance" (AMaMeF; a Scientific Programme of ESF),
- European Office of Aerospace Research & Development (EOARD),
- EURO Working Group on Continuous Optimization (EUROPT),
- The Scientific and Technological Research Council of Turkey (TÜBİTAK),
- Operations Research Society of Turkey (YAD; ORST).

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.

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

- chances for young scientists from Turkey given 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 at by the young people,
- reconfirmation, consolidation and manifestation of the Department of Financial Mathematics of IAM as founded by Professor Hayri K rezliođlu,
 - activation of interest in the areas of financial mathematics and stochastic calculus among teachers and students likewise;
 - colleagues from Turkey and other countries met and started to prepare common projects and to 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 abroad for scientific stays,
 - creation of a research network on financial mathematics in Turkey,
 - all of this under the umbrella and perspectives given by AMaMeF and ESF,
 - recontact with the Turkish financial sector as expressed by banks,
 - scientific education and impulses given to Turkish bankers,
 - introduction of and emphasis put on ESF and its program AMaMeF as a institution of excellence, of generosity and giving chances to make premium events become true.

The organizers would like to express their cordial thanks to all the precious sponsors for all their kind interest and generous support of the scientific double-event celebrated at METU, Ankara, in April 2008.

Cordial gratitude to the precious sponsors and *all* those friends who served in making our two scientific events in honour of Professor Hayri K rezliođlu a success and, as the organizers hope, a contribution to collaboration, friendship and development in the area of financial mathematics and stochastic calculus, in Europe and the world!

Ankara, June 14, 2008



Group Photo at the Occasion of the Opening Ceremony at April 25, 2008.
(Thanks for courtesy given by IAM, METU.)

enclosure: Appendices

Appendices:

Appendix I.

“The Simulation Tool Box for the Financial Engineer” Series of Seminars

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

- Prof. Dr. Ralf Korn (Univ. Kaiserslautern & Fraunhofer Institute for Industrial Mathematics)
- Dipl. Math. Elke Korn (Kaiserslautern)

Dates: April 23-24, 2008

Places: April 23: Department of Mathematics, METU; April 24: CCC, METU

http://korezlioglu.iam.metu.edu.tr/korezlioglu/index.php/Pre-Workshop_Seminar_Series

The course contained both introductory and advanced aspects of modelling and of Monte Carlo methods which are widely used in financial engineering. All methods were thoroughly introduced and illustrated by computer examples. Stress was laid on the practical application.

For each topic numerical algorithms were presented and demonstrational software were handed out to the course attendants. Participants had been encouraged to bring their laptops along to the course as practical exercises and demonstrations were also included in the workshop!

Due to its structure the course aimed at a wide range of audience which includes financial economists, financial engineers, mathematicians and physicists interested in financial mathematics. While the first day was more concentrated on standard methods, the second day contained many advanced and very recent topics.

The program of this two days' events was organized as follows:

Day 1: *“Introduction to modelling, options, and numerical methods”*

- Basic stochastic models for security prices: Modelling, properties and simulation,
- Monte Carlo method,
- Variance reduction methods for the Monte Carlo method,
- Working with Itô calculus: A non-technical introduction for the practitioner,
- Option pricing in the Black-Scholes setting: From vanilla products to exotics,
- Monte Carlo methods for pricing exotic options.

Day 2: *“More on options, interest rate models and structured products”*

- Interest rate modelling: Popular short rate models,
- Interest rate modelling: Monte Carlo simulation,
- Model calibration,
- Simulation for Heston's stochastic volatility model and option pricing,

- Levy process modelling in finance,
- Simulation of Levy processes.

Please find closer information about this *Series of Seminars* under

http://korezlioglu.iam.metu.edu.tr/korezlioglu/index.php/Pre-Workshop_Seminar_Series.

Ralf Korn holds a chair in financial mathematics at the University of Kaiserslautern (Germany). He has written two books and has published numerous articles in the area of mathematical finance. He also is an associate editor of *Mathematical Finance* and of *Mathematical Methods of Operations Research*. He is the deputy chair of the German Association for Insurance and Financial Mathematics (DGVFM). *Elke Korn* is an independent consultant for financial mathematics and statistics. She is co-author of the books “Option pricing and portfolio optimization” published by the AMS and “Mathe & Ökonomie”, an introductory textbook for mathematical applications in economics and finance.

Appendix II.

PROGRAM

Seminar Series for Practitioners “The Simulation Tool Box for the Financial Engineer”

Given by
Ralf KORN and Elke KORN
University of Kaiserslautern, Germany

Wednesday, April 23

Place: Arf Lecture Hall, Dept. of Math., METU

08:30-09:20	Registration
09:20-09:30	Opening Session
09:30-10:50	Seminars for Practitioners and Students: “ <i>Introduction and Basic Ideas</i> ” “ <i>Introduction to the Black-Scholes setting</i> ” “ <i>Simulation of Brownian Motion and Simple Stock Price Processes</i> ”
10:50-11:10	Coffee-Tea Break
11:10-12:30	Seminars for Practitioners and Students (continued): “ <i>Basics of Itô calculus</i> ” “ <i>Monte Carlo Methods and Option Pricing</i> ” <i>Practical Exercises (with laptop!)</i>
12:30-13:30	Lunch
13:40-14:30	Seminars for Practitioners and Students (continued): “ <i>Pricing Exotic Options by Monte Carlo I + II</i> ”
14:30-14:40	Coffee-Tea Break
14:40-15:40	Seminars for Practitioners and Students (continued): <i>Practical Exercises (with Laptop!)</i>

Thursday, April 24

Place: Hall D, Cultural and Convention Center, METU

09:30-10:50	Seminars for Practitioners and Students: “ <i>Calculating the Greeks with Monte Carlo</i> ” “ <i>Popular Interest Rate Models</i> ”
10:50-11:10	Coffee-Tea Break
11:10-12:30	Seminars for Practitioners and Students (continued): “ <i>Numerical Methods for Solving Stochastic Differential Equations</i> ” “ <i>Simulating Interest Rate Models with Monte Carlo</i> ”
12:30-13:30	Lunch
13:40-14:30	Seminars for Practitioners and Students (continued): “ <i>Stochastic Volatility</i> ” “ <i>Simulating the Heston Model</i> ”
14:30-14:40	Coffee-Tea Break
14:40-15:40	Seminars for Practitioners and Students (continued): “ <i>Simulation of Lévy processes in Finance</i> ” <i>Practical Exercises</i>

**Workshop on Recent Developments in
Financial Mathematics and Stochastic Calculus**

Thursday, April 24

Place: Room 209, IAM, METU	
16:00-19:00	Registration and Get-Together at Institute of Applied Mathematics, METU

Friday, April 25

Place: Cultural and Convention Center, METU	
07:45-09:15	Registration in the Foyer of Cultural & Convention Center, METU

Place: Hall A, Cultural and Convention Center, METU	
Chair: Gerhard-Wilhelm WEBER	
09:30-10:30	Opening Session
10:30-11:15	Plenary Talk Wolfgang J. Runggaldier (Università degli Studi di Padova, Italy): “ <i>Stochastic Dynamic Optimization Problems in Finance when Information is Incomplete</i> ”
11:15-11:35	Coffee-Tea Break

Place: Hall A, Cultural and Convention Center, METU	
Chair: Uluğ ÇAPAR	
11:35-12:20	Plenary Talk

	Süleyman ÜSTÜNEL (Ecole Nationale Supérieure des Télécommunications, Paris, France): <i>“The Solutions of the Monge-Ampere Equation in Banach Spaces”</i>
12:20-13:30	Lunch

13:30-15:00	
Place: Arf Lecture Hall, Dept. of Math., METU	Place: G. Ikeda Seminar Room, Dept. of Math., METU
Chair: Ralf KORN	Chair: Şaziye GAZİOĞLU
Stochastic Processes	Option and Derivative Pricing
<ul style="list-style-type: none"> • Allaberen ASHYRALYEV (Fatih University, Istanbul, Turkey): <i>“On the Difference Schemes for Stochastic Differential Equations”</i>, • Azize B. HAYFAVİ (IAM, METU, Ankara, Turkey): <i>“On Vasicek Stochastic Interest Rate Process with Stochastic Volatility”</i>, • Arash FAHİM (Ecole Polytechnique, France): <i>“Probabilistic Numerical Methods for Fully Nonlinear Parabolic PDEs”</i> 	<ul style="list-style-type: none"> • Sühan ALTAY (Vienna University of Technology, Austria): <i>“Bond Prices Via Nuclear Space Valued Semi-Martingales”</i>, • Ahmet CAMCI (Bilkent University, Ankara, Turkey): <i>“Pricing American Contingent Claims by Stochastic Linear Programming”</i>, • Zehra Ekşi (Vienna Institute of Finance, Vienna, Austria): <i>“Inflation Indexed Derivative Pricing: A Multi-country Model”</i>
15:00-15:30	Coffee-Tea Break

Place: Arf Lecture Hall, Dept. of Math., METU	
Chair: Halil Mete SONER	
15:30-16:15	Plenary Talk Ralf KORN (University of Kaiserslautern, Germany): <i>“Are Modern Portfolio Optimization Methods Really Applicable?”</i>
16:15-17:00	Invited Talk Erhan BAYRAKTAR (University of Michigan, Ann Arbor, USA): <i>“On the Pricing of Asian Options for Jump Diffusions”</i>
17:00-17:30	Coffee-Tea Break

17:30-19:30	
Place: Arf Lecture Hall, Dept. of Math., METU	Place: G. Ikeda Seminar Room, Dept. of Math., METU
Chair: Iddo ELIAZAR	Chair: İnci BATMAZ
Option Pricing and Hedging	Statistics and Modeling
<ul style="list-style-type: none"> • Harry ZHENG (Imperial College, London, UK): <i>“Approximation of Asian/Basket Options Pricing”</i>, • Hüseyin MERDAN (TOBB University of Economics and Technology, Ankara, Turkey): <i>“Dynamic of the Assets Pricing in Markets”</i>, • Zbigniew MATOSEK (Vrije Universiteit, Amsterdam, The Netherlands): <i>“Optimal Hedging Strategy under the Forward Smile Problem. On the Example of Cliquet Options with a Global Floor”</i> 	<ul style="list-style-type: none"> • Gerhard-Wilhelm WEBER (Departments of Financial Mathematics and Scientific Computing, IAM, METU, Ankara, Turkey): <i>“Approximation of Stochastic Differential Equations by Additive Models Using Regression, Splines and Conic Programming”</i>, • Elçin KARTAL (Department of Statistics, METU, Ankara): <i>“Robust Metamodelling of Complex Systems”</i>, • Iddo ELIAZAR (Department of Technology Management, Holon Institute of Technology): <i>“Scale-Invariance of Random Populations: From Paretian to</i>

	<p><i>Poissonian Fractality</i> ,</p> <ul style="list-style-type: none"> • Çağlar TUNCAY (Department of Physics, METU, Ankara): <i>“Randomness and Power Laws in Stock Market</i>
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20:00-22:30	Workshop Dinner at Vişnelik (Restaurant of METU Alumni Association)
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Saturday, April 26

Place: Arf Lecture Hall, Dept. of Math., METU	
Chair: Süleyman ÜSTÜNEL	
08:45-09:30	Plenary Talk Uluğ ÇAPAR (Sabancı University, Istanbul, Turkey): <i>“An Excursion in Wiener and White-Noise Space Distributions with Emphasis on Körezlioğlu-Üstünel Distributions”</i>
09:30-10:15	Invited Talk Deniz SEZER (York University, Canada): <i>“Information Reduction by Level Crossings in a Credit Risk Model”</i>
10:15-10:35	Coffee-Tea Break

10:35-12:35	11.35-12.35
Place: Arf Lecture Hall, Dept. of Math., METU	Place: G. Ikeda Seminar Room, Dept. of Math., METU
Chair: Giray ÖKTEN	Chair: Harry ZHENG
Special Session	Portfolio Optimization
<p>Martin RAINER (Value & Risk AG, Frankfurt, and ENAMEC Institute, Würzburg, Germany): <i>“Calibrated Stochastic Pricing Models: From Interest to Credit Derivatives”</i>,</p> <ol style="list-style-type: none"> 1. Interest product valuation <ol style="list-style-type: none"> 1.1 short rate models 1.2 market models 2. Credit derivatives valuation <ol style="list-style-type: none"> 2.1 intensity models 2.2 cds forward rate model 	<ul style="list-style-type: none"> • Ayşegül İSCANOĞLU ÇEKİÇ (Department of Financial Mathematics, IAM, METU, Ankara, Turkey): <i>“Optimal Portfolio and Consumption Choice under the Risks of Jump and Volatility”</i>, • Ethem ÇANAKOĞLU (Koc University, Istanbul, Turkey): <i>“Portfolio Selection in Stochastic Markets: Utility Based Approach”</i>
12:35-13:45	Lunch

13:45-15:15	
Place: Arf Lecture Hall, Dept. of Math., METU	Place: G. Ikeda Seminar Room, Dept. of Math., METU
Chair: Allaberen ASHYRALYEV	Chair: Wolfgang J. RUNGGALDIER
Statistics and Modeling	Credit Risk and Interest Rate Models

<ul style="list-style-type: none"> • Hakan ÖKTEM (Department of Scientific Computing, IAM, METU, Ankara, Turkey): “<i>An Introduction of Stochastic Hybrid Systems with Memory</i>”, • Iddo ELIAZAR (Department of Technology Management, Holon Institute of Technology, Holon, Israel): “<i>Lorenzian Analysis of Infinite Poissonian Populations and the Phenomena of Paretian Ubiquity</i>”, • Güvenç ARSLAN (Başkent University, Ankara, Turkey): “<i>A Software for Multi-Kernel Distance Based Clustering</i>” 	<ul style="list-style-type: none"> • Korhan NAZLIBEN (Department of Financial Mathematics, IAM, METU, Ankara, Turkey): “<i>Some Extensions to CREDITRISK+</i>”, • Muzaffer AKAT (Bahcesehir University, Istanbul, Turkey): “<i>Multiscale Models in Credit Risk</i>”, • Şirzat ÇETİNKAYA (Istanbul, Turkey): “<i>Stochastic Mortality Application to Interest Rate Models</i>”
15:15-15:35	Coffee-Tea Break

Place: Arf Lecture Hall, Dept. of Math., METU	
Chair: Monique JEANBLANC	
15:35-16:20	Plenary Talk Halil Mete SONER (Sabancı University, Istanbul, Turkey): “ <i>Pricing in an Il-liquid Market</i> ”
16:20-16:40	Coffee-Tea Break

Place: Arf Lecture Hall, Dept. of Math., METU	
Chair: Monique PONTIER	
16:40-17:25	Plenary Talk Monique JEANBLANC (Université d’Evry Val d’Essonne, France): “ <i>Initial Times and Dynamic Modelling of Successive Defaults</i> ”
17:25-17:45	Coffee-Tea Break

17:45-19:45	
Place: Arf Lecture Hall, Dept. of Math., METU	Place: G. Ikeda Seminar Room, Dept. of Math., METU
Chair: Azize HAYFAVI	Chair: Iddo ELIAZAR
Jump Detection	Option Pricing and Portfolio Selection
<ul style="list-style-type: none"> • Monique PONTIER (Institut Mathematiques de Toulouse Universite de Toulouse (Paul Sabatier), France): “<i>Detection of Volatility Jumps</i>”, • Havva Özlem DURSUN (Department of Financial Mathematics, IAM, METU): “<i>Jump Detection with Power and Bipower Variation Processes</i>”, • Yeliz Yolcu OKUR (University of Oslo, Norway): “<i>Optimal Consumption and Portfolio for an Insider in a Market with Jumps</i>”, • Andrea BARTH (CMA, University of Oslo, Norway): “<i>Simulation of Random Fields and Applications</i>” 	<ul style="list-style-type: none"> • Giray ÖKTEN (Department of Mathematics, Florida State University, Tallahassee, USA): “<i>Transformation Methods and Error Bounds for Low-Discrepancy Sequences in Pricing Derivatives</i>”, • Şaziye GAZİOĞLU (Department of Economics, and Department of Financial Mathematics, IAM, METU, Turkey, and University of Aberdeen, UK): “<i>Hysteresis and Cyclical Adjustment in the Stock Markets</i>”, • Fatih TANK (Department of Statistics, Kirikkale University, and Department of Financial Mathematics, IAM, METU, Ankara, Turkey): “<i>A Study on Fuzzy Portfolio Selection in Insurance</i>”

Place: Arf Lecture Hall, Dept. of Math., METU	
19:45-20:00	Closing Session

20:15-22:45	Visit of a Restaurant with the Staying Guests
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Sunday, April 27

Sight-Seeing Tour in Ankara offered to our guests.