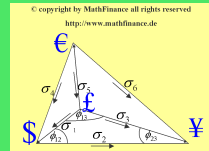


derivatives and risk
management in
theory and practice

Frankfurt MathFinance Workshop
2nd–4th April 2003
<http://institute.mathfinance.de/workshop/>



1. Organising committee

- Dr Hans-Peter Deutsch, d-fine
- Prof Götz Kersting, Frankfurt MathFinance Institute
- Tino Kluge, University of Oxford, OCIAM
- Dr Uwe Wystup, Commerzbank

The event takes place in Commerzbank and d-fine conference rooms. For further details refer to our web site or contact us at workshop@institute.mathfinance.de.

2. Contents

The workshop is intended for practitioners of the areas of trading, quantitative or derivative research and risk management as well as for academics studying or researching in the field of financial mathematics or finance in general.

The talks during the three days of the workshop cover a broad range of current topics and are presented by internationally known academics and practitioners. There will be enough time for questions and discussions after each talk and additional breaks provide you the opportunity to build networks within the quantitative finance community.

3. List of speakers

- Dr Jörg Behrens, Ernst & Young
- Dr Stefan Benvegnù, Deutsche Bank
- Dr Nicole Branger, Goethe University
- Prof Pierre Collin-Dufresne, Carnegie Mellon University
- Dr Bernd Engelmann, Bundesbank
- Dr Robert Fiedler, Algorithmics Frankfurt
- Prof Rüdiger Frey, University of Leipzig
- Dr Jürgen Hakala, Commerzbank
- Dr Vicky Henderson, University of Oxford
- Dr David Hobson, University of Bath
- Prof Claudia Klüppelberg, Technical University Munich
- Prof Christoph Kühn, Frankfurt MathFinance Institute
- Dr Jürgen Linde, Dresdner Bank
- Dr Fehmi Özkan, University of Freiburg
- Christoph Reisinger, University of Heidelberg
- Dr Richard Rossmanith, d-fine
- Prof Wolfgang Schmidt, HfB
- Prof Ronald Smith, Loughborough University
- Dr Mikhail Soloveitchik, d-fine
- Prof Robert Tompkins, HfB
- Dr Torsten Wegner, d-fine

This event is sponsored by



4. Conference Programme

Wednesday, 2 April 2003: Kaisersaal, Commerzbank main branch, Kaiserstrasse 30

09:00 Registration

09:15 Dr Nicole Branger
Is Volatility Risk Priced? Properties of Tests Based on Option Hedging Errors

This paper provides an in-depth analysis of the properties of popular tests for the existence and the sign of the market price of volatility risk. These tests are frequently based on the fact that for some option pricing models under continuous hedging the sign of the market price of volatility risk coincides with the sign of the mean hedging error. Empirically, however, these tests suffer from both discretization error and model risk. We show that these two problems may cause the test to be either no longer able to detect additional priced risk factors or to be unable to identify the sign of their market prices of risk correctly. Our analysis is performed for the model of Black Scholes and the stochastic volatility (SV) model of Heston. In the model of BS, the expected error for a discrete hedge is positive, leading to the wrong conclusion that the stock is not the only priced risk factor. In the model of Heston, the expected hedging error for a hedge in discrete time is positive when the true market price of volatility risk is zero, leading to the wrong conclusion that the market price of volatility risk is positive. If we further introduce model risk by using the BS delta in a Heston world we find that the mean hedging error also depends on the slope of the implied volatility curve and on the equity risk premium. Under parameter scenarios which are similar to those reported in many empirical studies the test statistics tend to be biased upwards. This means that sometimes the test does not detect negative volatility risk premia, or it signals a positive risk premium when it is truly zero. The results of this test furthermore strongly depend on the location of current volatility relative to its long-term mean, and the degree of moneyness of the option. As a consequence the empirical tests may suffer from the problem that the researcher cannot draw the hedging errors from the same distribution repeatedly. This implies that there is no guarantee that the empirically computed t-statistic has the assumed distribution. This is joint work with Prof Christian Schlag.

10:30 Dr David Hobson
Real options, non-traded assets and utility indifference prices

We consider a financial model with both traded and non-traded assets, and show that the utility indifference (bid) price for a contingent claim on a non-traded asset is bounded above by the expectation under the minimal martingale measure. This bound also represents the marginal price for the claim. The bound and the marginal bid price are independent of both the utility function and initial wealth of the agent.

11:30 Dr Jürgen Hakala
A time-discrete model for forward volatility

A model for forward volatilities in a time-discrete volatility setting is applied to first generation exotic options. To get a tractable simplified model of the real world the assumption of observable market volatilities is relaxed to the point that market volatilities are evolving continuously through time, but can be observed at few points in time only. The natural question arising within that setting is a suitable hedge strategy and the implied costs arising from the chosen strategy. The strength of this approach is the intuitive meaning of the leading terms in a Taylor-Expansion of the pricing equation.

This is joint work with Ulrike Polte and Dimitri Topaj.

12:30 lunch

13:30 Prof Claudia Klüppelberg
Optimal Portfolios with Bounded Capital-at-Risk

We investigate some portfolio problems that consist of maximizing expected terminal wealth under the constraint of an upper bound for the risk, where we measure risk by the variance, but also by the Capital-at-Risk (CaR). The solution of the mean-variance problem has the same structure for any price process which follows an exponential Lévy process. For the mean-CaR problem we make use of an approximation of the Lévy process as a sum of a drift term, a Brownian motion and a compound Poisson process. Certain relations between a Lévy process and its stochastic exponential are investigated.

To appear in Finance and Stochastics.

14:30 Dr Bernd Engelmann
The Basel II IRB Approach – How Could a Validation Procedure Look Like?

Under the proposed new capital adequacy framework, Basel II, capital charges for credit risk in the IRB approach are based on several risk parameters of an individual exposure estimated by financial institutions, the probability of default, the loss given default, and the exposure at default. In this talk we will focus on rating systems and analyse several quality measures we have found in the literature. We will discuss their usefulness for validation purposes and draw conclusions on how a validation procedure could look like.

15:30 tea break

16:00 Dr Torsten Wegner
On finite dimensional Term structure models Considering Seasonality of Power Prices

A log-normal mean-reverting diffusion model with time-dependent parameters is used to describe the stochastic process followed by prices at the electricity spot-market. The time-dependence is utilized to account for effects of seasonality which are an immediate consequence of the fact that electricity is hard to store.

A Black-Scholes-like derivation is used to give a valuation model for pricing derivative securities. This model will be applied to swing contracts. The latter represent a very flexible kind of options that can even be endowed with contractual penalties. Different penalty functions are studied within a finite-difference approximation scheme. The model parameters are calibrated to market data from the European Electricity Exchange in Leipzig (Germany).

17:00 Dr Vicky Henderson
A Comparison of q -optimal option prices in a Stochastic Volatility Model

This paper investigates option prices in an incomplete stochastic volatility model with correlation. In a general setting, we prove an ordering result that convex option prices are decreasing in the market price of volatility risk.

We investigate the q -optimal class of pricing measures. Using the ordering result, we prove comparison theorems between option prices under the minimal martingale, minimal entropy and variance optimal pricing measures. If the mean-variance tradeoff is deterministic, this collapses to the well known result that option

prices computed under these three pricing measures are the same. Specialising to the Heston model with mean-variance tradeoff increasing in volatility, enables us to deduce option prices are decreasing in the parameter q . Numerical solution of the pricing

pde corroborates the theory and shows the magnitude of the differences in option price due to varying q . Choice of q is shown to influence the shape of the implied volatility smile for varying maturity options.

Thursday, 3 April 2003: d-fine building, Eschborn, Mergenthalerallee 55

08:30 Prof Ronald Smith
Optimal compact finite-difference scheme for the Black-Scholes Equation

Compact numerical schemes use the minimum number of successive mesh points and of time steps. For the Black-Scholes equation this is 3 (arbitrarily-spaced) share price mesh points by 2 time steps. A general compact numerical scheme would be a linear implicit equation involving the computed option values at 6 grid points. Thus, 5 degrees of freedom are available to make the discretization errors be small. The optimal scheme uses all that adjustability to achieve errors at the grid points of fifth order in the step length and to all orders in time. There are stability restrictions upon the permissible time step. Unconditional stability can be achieved at the sacrifice of one order in the accuracy, or with the simplifications of fixed interest rate, fixed volatility and specified time-dependence (related to interest rate and volatility) of logarithmically-spaced grid points. Simple test cases suggest that for typical levels of accuracy, the computational resources can be 0.001 of conventional explicit schemes. It would seem feasible to perform the profusion of calculations needed to span scenarios of changing market rates, asset volatilities and strike prices.

Published in Proc Roy Soc Lond

9:30 Prof Wolfgang Schmidt
Modeling Default Dependence with Threshold Models

We investigate the problem of modeling defaults of dependent credits. In the framework of the class of structural default models we study threshold models where for each credit the underlying ability-to-pay process is a transformation of a Wiener processes. We propose a model for dependent defaults based on correlated Wiener processes whose time scales are suitably transformed in order to calibrate the model to given marginal default distributions for each underlying credit. At the same time the model allows for a straightforward analytic calibration to dependency information in the form of joint default probabilities. We illustrate the application of the model providing some examples of the pricing of basket default swaps.

This is a joint paper with Ludger Overbeck.

10:30 tea break

11:00 Dr Jürgen Linde and Christoph Reisinger
Efficient Numerical Techniques for Pricing Multivariate Options

The solution of multidimensional PDEs can only be achieved by interplay of several sophisticated numerical techniques. For high-dimensional problems it is essential to identify a few principal components that accurately approximate the full system. These equations can be dealt with by sparse grid techniques, e.g. the combination technique that extrapolates the solution from substantially less degrees of freedom and additionally allows parallelisation by simple data distribution. For the solution of lower dimensional problems (or thus reduced systems) efficient numerical techniques – combining the building blocks discretisation, grid generation and solver – are at hand. These methods ensure a stable and high order discretisation. Non-smooth regions as they typically appear in option pricing problems can be handled by a priori (e.g. refinement by mesh grading) or more advanced a posteriori (e.g. adapted to

finite element methods) adaptivity strategies. Large discretised systems can be solved efficiently by multigrid techniques that can handle unrestricted problems (resulting from European options) as well as obstacle problems (stemming from American style options). In several cases high-order schemes directly yield estimates for sensitivities.

12:00 Dr Jörg Behrens
Modelling dependencies: some practical examples

We discuss the impact of modelling dependencies for a few selected examples of practical relevance.

13:00 lunch

14:00 Dr Mikhail Soloveitchik
Growth Optimal Portfolios in a semimartingale context

Growth Optimal Portfolios (GOP) are used as a pricing Numeraire in incomplete markets. We consider methods of analytical and numerical computing of GOP for semimartingale market models. The approach we consider makes use of the generalized Kramer transformation. Applications for Monte-Carlo pricing are discussed.

15:00 Prof Robert Tompkins
Flexible Complete Models with Stochastic Volatility: Generalising Hobson & Rogers (1998)

Hobson and Rogers (1998) propose an option pricing model where the volatility is a deterministic function of the moving average of past (logarithm of) underlying prices. They show that such a model can also generate implied volatilities that vary across striking price and term to expiration. In this research, this model is tested on actual option markets.

While the Hobson and Rogers (1998) model produces divergences from Black Scholes (1973) prices on a microscopic scale, we have not been able to replicate actual option prices with this model. To determine prices from this model we develop a robust analytic approximation.

To better fit observed options prices, we generalise the model Hobson and Rogers (1998) by the addition of two additional parameters. This model is able to match option prices on the British Pound/US Dollar across both the striking price dimension (smiles) and across different maturities (the term structure of implied volatility). By use of Mavillian calculus, we are able to determine partial derivatives of the generalised model and compute hedging ratios.

This is joint work with Friedrich Hubalek and Josef Teichmann.

16:00 tea break

16:30 Dr Robert Fiedler
Quantification of Funding Liquidity Risk in a Common Framework with ALM

The quantification of Funding Liquidity Risk is developed and discussed. The concepts of Expected Liquidity (Forward Cash Exposure), Expected Liquidity-at-Risk, Counterbalancing Capacity and Day-Count-to-Default are introduced and it is discussed how they fit into an overall ALM strategy as well as into more general regulatory / supervisory requirements.

The transfer of methodologies from trading risk to ALM is examined; difficulties and alterations are discussed and it is considered how they fit into recent regulatory initiatives (BIS2).

18:00 dinner

Friday, 4 April 2003: d-fine building, Eschborn, Mergenthalerallee 55

09:15 Prof Rüdiger Frey

On Dynamic Models for Portfolio Credit Risk and Credit Risk and Credit Contagion

It is by now well known that the performance of models for portfolio credit risk is very sensitive to the modelling of dependence between defaults of different obligors. In this talk we will be concerned with dynamic models for portfolios of dependent defaults. After a brief survey of existing approaches, we concentrate on models for credit contagion, i.e. models where the default of one company has a direct impact on the default intensity of other firms. We introduce a Markovian model and discuss the various types of interaction. Finally we present limit results for large portfolios in a homogeneous model with mean-field interaction and analyze the impact of credit contagion on the portfolio loss distribution.

10:15 tea break

10:45 Prof Pierre Collin-Dufresne

Identification and estimation of maximal affine term structure models: an application to stochastic volatility

We propose a canonical representation for affine term structure models where the state vector is comprised of the first few Taylor-series components of the yield curve and their quadratic (co-) variations. With this representation: (i) the state variables have simple physical interpretations such as level, slope and curvature, (ii) their dynamics remain affine and tractable, (iii) the model is by construction ‘maximal’ (i.e., it is the most general model that is econometrically identifiable), and (iv) modelinsensitive estimates of the state vector process implied from the term structure are readily available. We find that the ‘unrestricted’ A1 (3) model of Dai and Singleton (2000) estimated by ‘inverting’ the yield curve for the state variables generates volatility estimates that are negatively correlated with the time series of volatility estimated using a standard GARCH approach. This occurs because the variance of the short rate is at the same time a linear combination of yields (i.e., it impacts the cross-section of yields), and the quadratic variation of the spot rate process (i.e., it impacts the time-series of yields). We then investigate the A1 (3) model which exhibits ‘unspanned stochastic volatility’ (USV). This model predicts that the cross section of bond prices is independent of the volatility state variable, and hence breaks the tension between the time-series and cross-sectional features of the term structure inherent in the unrestricted model. We find that explicitly imposing the USV constraint on affine models significantly improves the volatility estimates, while maintaining a good fit cross-sectionally.

11:45 Dr Richard Rossmann

Data Quality Measures and Completion of Market Data

Data Quality Measures and Completion of Market Data “Outliers” and “incomplete data” are very common problems that financial institutions face when they collect financial time series in

IT data bases from commercial data vendors for regulatory, accounting, and benchmarking purposes. We argue that outlier detection and data completion are closely (almost interchangeably) related. Then we present several data completion techniques, some of which are productively used in practice, and others which are less established. Finally, optimal completion methods are recommended, based on an empirical study for the completion of swap and forward rate curves in the currencies Deutsche Mark (respectively Euro), Pound Sterling, and US Dollar.

This talk is based on the speaker’s thesis for the Mathematical Finance postgraduate program at Oxford University. It represents a snapshot of ongoing market data and time series research at d-fine, which continues to concern the speaker and several of his colleagues.

12:45 lunch

14:00 Dr Stefan Benvegnù

Credit Risk for CDO Portfolios

A model that assesses the credit risk for a CDO portfolio is presented. Starting with the introduction of different types of CDOs, it is shown how a Merton type model can be used to obtain risk characteristics of different tranches of CDOs. A short comparison to other existing models that evaluate CDO structures is given.

15:00 Dr Fehmi Özkan

Lévy processes in credit risk

Mathematical credit risk models in the literature are mainly models based on Brownian motion although it is known that real-life financial data provides a different statistical behaviour than that implied by these models. Lévy processes are an appropriate tool to increase accuracy of models in finance. They have been used to model stock prices, and term structures of interest rates, thus allowing more accurate derivative pricing and risk management. This presentation shows how Lévy processes can be applied to credit risk models.

16:00 tea break

16:30 Prof Christoph Kühn

Game Options: Pricing, Hedging, and Optimal Exercise

A game option (also referred to as Israeli option or recall option) is a generalization of an American option which also enables the seller to terminate it before maturity, but at the expense of a penalty.

In the first part of the talk we introduce a general approach how to price derivatives in incomplete markets which can also be applied to game options.

Then, we describe the optimal exercise and hedging strategy for the Israeli put option and present a Monte Carlo valuation approach similar to Rogers (2002) (joint work with Jan Kallsen and Andreas Kyprianou).

5. Personal descriptions

Dr Jörg Behrens, Ernst & Young, Switzerland

Jörg is a partner in the Financial Services Risk Management team in Zurich and also heading the Capital Management & Financial / Business Modeling team within FSRM. He received his PhD from ETH Zurich for his research in high-energy physics at the LEP accelerator of the European Nuclear Research Facility CERN, Geneva.

Jörg joined Ernst & Young in July 2002 as former head of the Quantitative Risk Team of Andersen's Financial Risk Management practise which he joined in December 2000. Prior to that time Jörg held a number of key positions within the Risk Management area of UBS in London and Zurich. His industry knowledge includes 9 years of experience in Market and Credit Risk Management with a special emphasis on Financial and Business Model review and development. Jörg's deep Financial and Business modeling experience has gained him expertise in building highly effective and efficient models to support strategic decision-making at all levels within an organisation. Jörg's solid business background coupled with his strong technical know-how have afforded him well to serve as the engagement partner on projects ranging from those with completely quantitative deliverables to those with a high-level strategic advisory scope. Jörg serves as the hands-on engagement partner for projects in the fields of risk quantification, business process reengineering / optimisation, strategic analysis & planning (decision-support) and enhancement for credit and market risk with a special focus on capital management, RAROC (performance measurement) and all aspects of the new Basel II Accord. He is a regular speaker at various international conferences.

Dr Stefan Benvegnù, Deutsche Bank

Stefan Benvegnù currently works in the Economic Capital Methodology and Implementation group within Deutsche Bank's credit risk management department. His main working areas are credit risk modelling and securitizations. Prior to this position he worked as consultant in the financial software branch. He received a diploma in theoretical physics from the University of Karlsruhe and a PhD in mathematics from the University of Bochum.

Dr Nicole Branger, Goethe University

Nicole Branger is a postdoctoral researcher with the derivatives group lead by Professor Christian Schlag at Goethe University in Frankfurt am Main. She holds a PhD in economics from the University of Karlsruhe. Her research areas are derivatives and financial engineering. She is particularly interested in incomplete markets, interest rate derivatives, and model risk.

Dr Hans-Peter Deutsch, d-fine

Dr Hans-Peter Deutsch is Managing Director of d-fine GmbH, a leading financial services consulting firm in Germany. Before founding this firm he was Partner at Arthur Andersen and head of Andersen's Financial and Commodity Risk Consulting (FCRC) in Germany, which he founded in 1997 and developed from scratch to the over hundred people strong consulting practice which is the d-fine GmbH today.

He is also Faculty Member and Member of the Advisory Board of the Mathematical Finance Programme at the University of Oxford, UK, and Director of the German Chapter of GARP, the Global Association of Risk Professionals. He has worked with clients in several IT-based and quantitative trading and risk management projects, including software selection and development, pricing and risk management for derivatives. Dr Deutsch is a regular speaker at major conferences and author of many publications in this area including the book "Derivatives and Internal Models", now in its

2nd Edition.

Before joining Andersen, he headed trading system development at a major German Bank and served as a consultant with Andersen Consulting (now Accenture). He holds a "summa cum laude"-PhD in theoretical physics and is also author of about 20 international scientific publications in this field, mainly on Monte Carlo simulations of stochastic processes.

Prof Pierre Collin-Dufresne, Carnegie Mellon University

Pierre Collin-Dufresne is an Associate Professor of Finance at Carnegie Mellon University. He earned his PhD in 1998 from the HEC School of Management, Paris, France. Dr Collin-Dufresne's teaching and research interests include Asset and Contingent Claim Pricing, Fixed Income Securities, Default Risk, Emerging Markets, and International Finance. He has served as a consultant for multiple financial institutions and has several publications in refereed journals such as the Journal of Finance and Journal of Derivatives. He is a member of the Center for Computational Finance of Carnegie Mellon University and an associate editor of the Review of Financial Studies.

Dr Bernd Engelmann, Bundesbank

Bernd Engelmann is an economist in the Banking Supervision Research Group of the Deutsche Bundesbank in Frankfurt. He holds a diploma in mathematics from the University of Augsburg and a PhD in financial economics from the University of Vienna. He currently works on credit scoring and credit risk modelling.

Dr Robert Fiedler, Algorithmics Frankfurt

Robert Fiedler, born 1955 near Frankfurt, studied Mathematics, Computer Sciences and Philosophy at the Universities of Heidelberg and Darmstadt where he obtained a PhD in mathematics (differential geometry) and worked as a scientist and lecturer. He joined Banque Nationale de Paris in Frankfurt as a money market / interest rate derivatives trader, later heading up the asset/liability management team.

He was Deputy Head of Financial Markets at NatWest Markets in Frankfurt until he moved to risk management in London.

1997 he joined Deutsche Bank in Frankfurt, where he headed the team in Group Risk Management dealing with treasury and liquidity risk issues, reporting to the Group Head of Market- and Operational Risk.

After developing a new methodological framework for funding liquidity risk, he implemented this approach as a firm-wide liquidity risk IT solution called LiMA – Liquidity Measurement & Analysis. Since September 2000 he built as a Senior Director the benchmark solution for Funding Liquidity Risk at Algorithmics Inc., Toronto. Now he heads as an Executive Director Algorithmics' ALM and Liquidity Risk Solutions.

Prof Rüdiger Frey, University of Leipzig

Rüdiger Frey is Professor of Financial Mathematics at the University of Leipzig, Germany. Prior to that he held positions as Assistant Professor of Finance at the University of Zurich and as UBS research fellow in financial mathematics at the Federal Institute of Technology (ETH) in Zurich. He holds a diploma in mathematics from the University of Bonn where he received his PhD in financial economics in 1996. His main research fields are quantitative risk management and the pricing and hedging of derivatives under incompleteness and market frictions. Rüdiger has published research papers in leading journals and has given seminars at a number of important international conferences and institutions. He has also been involved in consulting projects for Swiss insurance companies

and banks.

Dr Jürgen Hakala, Commerzbank Securities, Financial Engineering

Jürgen Hakala is Head of Quantitative Research in Commerzbank ZGS FX. His research areas are models and products for foreign exchange derivatives and hybrid interest rate and foreign exchange models. Computational Finance is a key element for all his activities. He received a masters degree in theoretical physics from the University of Karlsruhe and a PhD in mathematics from the University of Bonn at the institute for Neural Networks.

Dr Vicky Henderson, University of Oxford

Vicky Henderson is Nomura Research Fellow at the Nomura Centre for Quantitative Finance, Mathematical Institute at the University of Oxford. She previously held postdoctoral positions at RiskLab, ETH Zurich and FORC at the University of Warwick. Since obtaining her PhD on passport option pricing from the University of Bath in 1999, Vicky has published in many leading journals on topics including comparison of option prices in jump diffusion and stochastic volatility models, options on non-traded assets, real options, Asian option symmetries and valuation of executive stock options. Vicky has presented at numerous international academic and practitioner conferences and previously worked as a Quantitative Analyst for Westpac, Sydney.

Dr David Hobson, University of Bath

Dr David Hobson is Reader in Statistics at the University of Bath. He also currently holds an Advanced Fellowship from the EPSRC which means that he can devote the next five years to research. His background is in probability theory, but now he works mainly on mathematical finance. He has worked extensively on stochastic volatility, passport options, and robust, model-independent bounds for the prices of barrier options. More generally his research interests concern the pricing of derivative securities in incomplete markets.

Tino Kluge, University of Oxford

Tino Kluge is a probationer research student at the Oxford Centre for Industrial and Applied Mathematics (OCIAM) where he is working on a project about energy derivatives. Tino received a diploma in Mathematics and Technology (Technomathematik) from Chemnitz University of Technology where his thesis was on the numerical solution of option pricing under the Heston stochastic volatility model. During his studies in Chemnitz he also worked as an intern for some month at DaimlerChrysler (Stuttgart) and Commerzbank (Frankfurt).

Prof Claudia Klüppelberg, Technical University Munich

Professor Dr Claudia Klüppelberg holds the Chair of Mathematical Statistics at the Center for Mathematical Sciences of the Munich University of Technology.

After her Diploma in Mathematics and a PhD at the University of Mannheim Claudia Klüppelberg spent five years (1990–1995) as a Postdoc in the Insurance Mathematics group of the Department Mathematik at ETH Zurich (with Profs. Hans Bühlmann and Paul Embrechts).

During 1995–97 Claudia Klüppelberg was Associated Professor of Applied Statistics at the Mathematics Department of the University of Mainz. In Spring 1997 she accepted an offer of the Munich University of Technology. She took part in creating a very successful Diploma Programme in Financial and Economic Mathematics, which started in October 1997. This programme contains courses in financial and insurance mathematics.

Claudia Klüppelbergs research interest combine various areas of applied probability and statistics, and her work is often motivated by real life problems. At the moment this concerns mainly the areas of insurance and finance. Both fields concentrate on financial

risk management; the mathematical models and methods, however, differ.

Besides numerous publications in scientific journals, Claudia Klüppelberg has coauthored the book Embrechts, P., Klüppelberg, C. and Mikosch T. (1997, 1999, 2001) Modelling Extremal Events for Insurance and Finance. Springer, Berlin.

Prof Christoph Kühn, Frankfurt MathFinance Institute

Christoph Kühn is Juniorprofessor at the Frankfurt MathFinance Institute. Prior to that he worked as a post-doctoral researcher at Vienna University of Technology. He holds a diploma in mathematical economics from the University of Marburg and a PhD in mathematics from Munich University of Technology.

His main research fields are pricing and hedging of derivatives in incomplete market models and models with transaction costs.

Dr Jürgen Linde, Dresdner Bank

Jürgen Linde works in the Global Models And Analytics Group at Dresdner Bank with focus on model validation for interest rate derivatives. Prior to his current position he was senior consultant at KPMG's "Financial Risk Management Advisory Group". He studied mathematics in Heidelberg and received his PhD at Dortmund's Scientific Computing Faculty where he worked on numerical techniques for partial differential equations.

Dr Fehmi Özkan, University of Freiburg

Fehmi Özkan teaches stochastics and mathematical finance at the University of Freiburg. He is also a research fellow at the Freiburg Centre for Data Analysis and Modelling. He got his PhD in mathematics from the University of Freiburg under the supervision of Ernst Eberlein in 2002. His research interests are statistical analysis of financial data and applications of Levy processes in finance, credit risk and Libor models.

Christoph Reisinger, University of Heidelberg

Christoph Reisinger works on option pricing at the Interdisciplinary Center for Scientific Computing (IWR) at the University of Heidelberg. Coming from computational fluid dynamics, the field of research covers numerical techniques for partial differential equations. Primary interests are currently feasible and accurate discretisations for high-dimensional PDEs resulting from multivariate option pricing problems. The focus is on sparse grid and extrapolation methods, which are coupled with dimension reduction approaches.

Dr Richard Rossmanith, d-fine

Richard Rossmanith is Senior Consultant at d-fine GmbH, the former Financial and Commodity Risk Consulting practice of Arthur Andersen. He joined Arthur Andersen in 1998, and has subsequently consulted German banks on quantitative finance, mathematical methods, IT integration, outsourcing, and regulatory compliance, and in particular on the issue of financial market data. The latter topic inspired his MSc thesis for the Mathematical Finance postgraduate program at Oxford University, and the talk at the conference gives a brief summary.

Mr Rossmanith studied Mathematics (and worked as University Assistant) at Universität Augsburg, Iowa State University in Ames (USA), and Friedrich-Schiller-Universität Jena, where he received his Dr rer nat (PhD) for a dissertation thesis on Lie Algebras, Group Algebras, and Computer Algebra.

Dr Rossmanith has been appointed Honorary Lecturer for Financial Mathematics by the University of St Andrews (Scotland) since 2000.

Prof Wolfgang Schmidt, Hochschule für Bankwirtschaft, Frankfurt

Wolfgang M. Schmidt is currently Professor for Quantitative Methods at the Hochschule für Bankwirtschaft (Business School for

Banking and Finance) in Frankfurt. From 1992 to 2002 he was Director and Head of Research and Analytics at Deutsche Bank AG in Frankfurt. Prior to joining Deutsche Bank he held teaching and research positions at the University of Jena, Berlin, Moscow and Tbilissi. He graduated in Mathematics from Dresden University of Technology and holds a PhD and Habilitation in the field of probability theory from the University of Jena. Prof Schmidt is the author of research papers in the fields of probability theory, stochastic processes and mathematical finance as well as co-author (with S. Assing) of the book "Continuous Strong Markov Processes in Dimension One – A Stochastic Calculus Approach", Springer Verlag. His current research interests include mathematical finance, risk management, credit default modelling, term structure modelling.

Prof Ronald Smith, Loughborough University

Ron Smith is Professor of Applied Mathematics at Loughborough University. His interest in optimal computation of equations with decay, flow and spread, arose in the 1990's from work with a team of UK Government scientists on predicting the isotopic fractionation of nuclear waste in groundwater flows. Computational improvements allowed a wide spectrum of future climates to be studied for less than the previous price of a single prediction. The political sensitivity of the isotopes and possible waste sites precluded open-literature publication of the teams' results. The computational ideas are not secret and are widely applicable, including to the Black-Scholes equation in mathematical finance.

Dr Mikhail Soloveitchik, d-fine

I am a senior-consultant at d-fine (former Financial and Commodity Risk Consulting practice of Arthur Andersen). I studied Mathematics at the Moscow State University (PhD 1989 in probability theory and stochastic processes) and hold a research position at the University of Heidelberg (Habilitation 1997). Last years I work as a consultant for the financial industry. My interest include quantitative mathematical analysis of financial markets and it's application to practical problems of financial risk management. I have been working on several projects in German and European financial institutes.

Prof Robert Tompkins, Hochschule für Bankwirtschaft, Frankfurt

Robert Tompkins is a University Dozent at the Technical University Vienna and has accepted an Honorary Professorship at the University of Warwick Business School, where he has taught courses on Financial Markets during the 2000/2001 academic year. He will start at HfB, Frankfurt, as a Professor of Finance in autumn 2003.

Dr Tompkins was formerly the Head of International Quantitative Research at Kleinwort Benson Investment Management. In addition, he remains the Managing Director of the Minerva Group. Prior to this, he was the Futures and Options Specialist at Merrill Lynch, Europe and an Interest Rate Options Dealer and Currency Options Trader at two major Chicago banks. He has three degrees from the University of Chicago, including an MA in Quantitative Methods and an MBA (honours). In addition, he completed his PhD in Finance at the University of Warwick in 1998 and his Habilitation in Finanzwirtschaft at the University of Technology, Vienna in 2000.

Robert has authored three books on Options and edited a book on exotic options "From Black Scholes to Black Holes". Robert is currently writing a series on Exotic Options, which appears in the Austrian Journal, Bank Archiv. This series will form the basis of a book that will be published by Cambridge University Press in 2002. He has published widely in RISK Magazine, and a number of academic journals including Journal of Futures Markets, Journal of Derivatives, Journal of Risk Finance, Journal of Risk, Quantitative Finance and the European Journal of Finance. Robert's current research interests include comparisons of established and emerging markets, volatility estimation and forecasting, implied volatility smile patterns and the hedging of exotic contingent claims.

Dr Torsten Wegner, d-fine

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