Monday	***4.1.2010***	***Chairman***
9:40 - 10:10	*registration*	*J. Večeř↓*

10:10 - 11:00 Jan Hannig · `The Univ. of N. Carolina at Chapel Hill, USA`

Continuum modeling of large networks

This paper is concerned with approximation of extremely large networks using time-dependent partial differential equations. In particular, we present conditions under which a sequence of parameterized Markov chains converges to its continuum limit, which is the solution to a PDE. We then apply this result to a communication model of network traffic.

11:10 - 12:00 Karel Janeček · `RSJ Invest, a.s., Prague, CZ`

Optimal control for jump processes

12:00 - 14:00 lunch time *K. Janeček↓*

14:00 - 14:50 Joern Sass · `Univ. of Kaiserslautern, Kaiserslautern, Germany`

Constraining the risk of utility maximizing strategies under partial information

We consider an investor who wants to maximize the expected utility of the terminal portfolio value obtained by trading in a financial market consisting of one riskless asset and several stocks. Stock returns are modeled as a stochastic differential equation with non-constant coefficients. If the drift depends on some process independent of the driving Brownian motion, it may not be adapted to the filtration generated by the stock prices. But only the latter can be observed and the underlying drift process has to be filtered from the observed stock prices. Due to the non-constant drift, in such a model with partial information the positions in the stocks vary between extreme long and short positions, making these strategies very risky when trading on a daily basis. We will discuss several approaches to deal with this problem. In particular, we impose a class of risk constraints on the strategy, computed on a short horizon, and then find the optimal policy in this class. This reduces the shortfall risk and leads to much more stable strategies which can be computed for classical drift models.

15:00 - 15:50 Jan Večeř · `Columbia University, New York, USA`

Lie Group Symmetry Analysis and Perspective Mapping in Option Pricing

A price of an option satisfies a certain partial differential equation when the underlying price process follows a geometric Brownian motion. The actual form of the partial differential equation depends on the contract, and on a chosen reference asset known as a numeraire. We consider three types of options: European/American, lookbacks, and Asians. European/American options are written on two underlying assets (for example on a stock and on a dollar), and thus their price admits two representations, depending on the reference asset chosen. Lookback options or Asian options depend on three assets (for example on a stock, on a dollar, and on an asset representing the maximum or average price), and thus their price admits three possible representations. We show that the partial differential equations for each type of an option contract are related via a relationship known as a perspective mapping. We use Lie group symmetry analysis to find all possible scaling symmetries for each given partial differential equation, and show how the symmetries of the equations expressed under different numeraires are linked by a perspective mapping.

15:50 - 16:20 coffee break *J. Sass↓*

Monday	***4.1.2010***	***Chairman***
15:50 - 16:20	*coffee break*	*J. Sass↓*

16:20 - 17:10 Petr Novotný · `Columbia University, New York, USA`

Optimal Execution of a Large Portfolio, A Multiple Exercise Option Approach

In this paper, we study the optimal execution of a large portfolio. We address this problem as a multiple exercise option and we find an optimal trading strategy as a function of the number of lots to buy or sell, and the time left before a given deadline. The large trader has two choices at each given moment: either to sell a portion of the portfolio immediately, or to wait for a better opportunity to sell. The multiple exercise approach can be used with any type of model for the price process. We model the dynamics of an order book directly, which allows us to capture the possible illiquidity of the market following a large trade. We show that the optimal strategy is monotone in the number of stocks to sell and the time left, meaning that a larger portfolio should be executed whenever a smaller portfolio is being executed.

17:20 - 18:10 Petr Veverka · `ÚTIA AS CR (AV ČR), Prague, CZ`

Backward stochastic differential equations and its application to finance

In this talk we show some basic results on BSDE such as existence and uniqueness of the solution, comparison principles and its application to hedging contingent claims in complete and incomplete markets.

18:20 - 18:40 Jakub Staněk · `FS ČVUT, Prague, CZ`

Modeling of diffusion in a connected bounded set

Consider a function $f \in C^2(\mathbb{R}^n)$ and denote $K = \{x \in \mathbb{R}^n : f(x) \leq c\}$. In this talk, we show an easily applicable procedure how to construct diffusion which does not leave the area K. We present conditions to have an absorbing boundary $S = \partial K$ for the diffusion and conditions for a reflecting boundary S.

19:00 - 22:00 dinner

Tuesday	***5.1.2010***	***Chairman***
9:10 - 9:40	*tea*	*J. Swart↓*

9:40 - 10:30 Libor Pospíšil · `Columbia University, New York, USA`

Maximum Drawdown of a Jump-Diffusion Process and the Corresponding PIDE

In this talk, we assume that the price of an asset can be modeled as a diffusion process plus a compound Poisson process. Subsequently, we address the question of pricing contracts involving maximum drawdown of the asset. Given the complexity of the underlying model, the most suitable method is deriving the partial integro-differential equations and solving them numerically. The special feature of the equations is the presence of the running maximum and the running maximum drawdown, which may be discontinuous due to the jumps in the asset price. We will also discuss the question of hedging.

10:40 - 11:30 Tomáš Tichý · `Technical University of Ostrava, CZ`

On the impact of concordance measures in portfolio selection theory

In portfolio several concordance measures (such as Spearman rho, Kendall tau, Gini gamma, Pearson coefficient of linear correlation) have been proposed to value the dependency among random returns. Clearly each measure can have a different impact in valuing the dependence of returns. We discuss and value the impact of different concordance measures in portfolio selection problems. In particular, we propose new concordance measures that capture the tail dependency and asymmetry of returns series. Moreover we compare the ex-post sample paths of wealth obtained adopting portfolio selection strategies that use different concordance measures.

11:30 - 13:00	*lunch time*	*J. Hannig↓*

13:00 - 13:50 Jan Swart · `ÚTIA AS CR (AV ČR), Prague, CZ`

The rebellious voter model - facts, conjectures and mysteries

In this talk we will consider a simple one-dimensional interacting particle system introduced by A. Sturm and the speaker, called the rebellious voter model. In this model individuals, situated on the one-dimensional integer lattice, can hold one of two possible opinions. As in a usual voter model, with rate α, an individual adopts the opinion of one of its neighbors. In addition, with rate $1-\alpha$, an individual looks at a neighbor and next nearest neighbor, and if these two disagree with each other, the individual changes its opinion. We will see that this last type of interaction gives an advantage to opinions that are locally in the minority, hence the name 'rebellious' voter model. I will discuss some rigorous results obtained for this model with A. Sturm and the results of detailed numerical simulations carried out with K. Vrbenský. These simulations suggest (as partly supported by rigorous proofs) that the model goes through a phase transition between coexistence and noncoexistence as α is increased beyond a critical point $\alpha_c \cong 0.5$. Mysteriously, for a one-sided version of the model, the critical point appears to be exactly $1/2$ and two important functions of the process appear to be given by simple, explicit formulas, a fact for which we have no explanation.

14:00 - 14:50 Bohdan Maslowski · `KPMS MFF UK, Prague, CZ`

LQ control for stochastic PDEs with fractional noise

14:50 - 15:20	*coffee break*	*T. Tichý↓*

Tuesday	***5.1.2010***	***Chairman***
14:50 - 15:20	*coffee break*	*T. Tichý↓*

15:20 - 15:45 Lenka Slámová · KPMS MFF UK, Prague, CZ

Lévy driven Ornstein-Uhlenbeck model for interest rates

The aim of this talk is to present recent results on the Heath-Jarrow-Merton (HJM) model of term structure of interest rates driven by a Lévy process with main attention paid to the case of a generalized Vasicek model of the short rate. We introduce the concept of Lévy processes and in particular subordinators such as generalized inverse Gaussian (GIG) process. Further, we focus on the Ornstein–Uhlenbeck process driven by a Lévy process. Consequently, we present the term structure HJM model driven by a Lévy process. We determine the no-arbitrage dynamics of the forward rate process and thus obtain a no-arbitrage Lévy driven short rate process. Focusing on the generalized Vasicek model with GIG–OU type short rate process, we conclude the talk by revealing the properties of this process such as positivity and mean reversion. The results were obtained in my master thesis from VU Amsterdam.

15:50 - 16:40 Olympia Hadjiliadis · City University of New York, USA

Drawdowns and rallies in a finite time-horizon and applications

In this work we derive the probability that a rally of a units precedes a drawdown of equal units in a biased random walk model and its continuous equivalent, a drifted Brownian motion model in the presence of a finite time horizon. A rally is defined as the difference of the present value of the holdings of an investor and its historical minimum, while the drawdown is defined as the difference of the historical maximum and its present value. We discuss two main applications of these results in finance and the detection of transient signals. In particular, first the results are applied to the problem of determining the probability that there is a given percentage rise of an investor's wealth from its historical minimum preceding a specific percentage drop of his/her wealth from its historical minimum when the investor has a finite window of opportunity and the wealth process is a Geometric Brownian motion. Another application of interest is the detection and identification of two-sided alternatives in the drift of a Brownian motion process when each alternative represents the direction of the signal and the signal is only available up to a specific given moment in time. We then generalize our underlying process dynamics to general diffusion processes and derive the Laplace transform of the probability that the drawdown precedes a rally of unequal units.

16:40 - 16:55	*break*	*B. Maslowski↓*

16:55 - 17:15 Jan Bártek · KPMS MFF UK, Prague, CZ

Stochastic porous medium equation with fractional Brownian motion

17:20 - 17:40 Jana Lipková · KPMS MFF UK, Prague, CZ

Reversible Reactions in Reaction-Diffusion Stochastic Simulation

Introduction to some mathematical models used in modelling of chemical reactions. Drawback of these models when reversible reactions are considered. Introduction to Andrew and Bray modelling of reversible reactions and related problems. Introduction and closer look at stochastic approach with implementation of probability.

17:45 - 18:05 Josef Janák · KPMS MFF UK, Prague, CZ

Ornstein-Uhlenbeck Bridge

18:10 - 18:30 Jana Šnupárková · KPMS MFF UK, Prague, CZ

Stochastic bilinear equations with fractional Brownian motion

We will speak about stochastic differential bilinear equations with fractional Brownian motion in the singular case $H < 1/2$ in infinite dimension.