Marc Jeanin

On the pricing of barrier options driven by additive processes (with M. Pistorius)

Abstract: Two ingredients encountered in many option-pricing models are (a) stochastic volatility and (b) jumps, where the latter is needed to capture short maturity option prices while the former is present to be able to fit multiple maturities at the same time. In the latter case the class of Lévy processes has been successfully employed to model option prices at single maturities. However, it has been observed by, amongst others, Carr et al. (2003) that due to their term structure of marginal distributions, Lévy models are not capable of calibrating simulateneously observed option prices across maturities. In this paper we consider option pricing under additive processes, which are Lévy-type processes with time-dependent (deterministic) characteristics whose increments are indepedent but not stationarity. At each fixed time an additive process still follows an infinitely divisible distribution but now there is more flexibility in fixing the term structure of the marginal distributions. For additive processes with piece-wise deterministic characteristics and hyper-exponential jumps we develop an algorithm to value barrier options and calculate the corresponding Greeks. The algorithm is based on a multi-dimensional Laplace-Fourier transform-method and employs matrix Wiener-Hopf factorisation techniques for a certain process closely related to the additive process under consideration. We illustrate the algorithm by simultaneously calibrating the model to Stoxx50E options at four different maturities and subsequently calculating the values and Greeks of a down-and-in call option under this model and comparing the outcomes with Monte Carlo simulation results. The numerical results show that the method is fast accurate and stable.

Guoping Xu

Bounds of basket option prices in a jump diffusion asset price model

Abstract: We apply Curran's and Rogers and Shi's conditioning approach and lower bounds for Asian options to derive bounds for basket options in a jump-diffusion asset price model. We show how to compute the partial exact part and how to derive an analytical closed-form expression for the lower bound for an arbitrary correlation structure between the underlying assets. Numerical results show the accuracy of the lower bound.

Zhogmin Luo

Credit product pricing and risk on the buy side

Abstract: TBA

Harry Lo

Spectral methods for volatility derivatives

Abstract: In the first quarter of 2006 Chicago Board Options Exchange (CBOE) introduced, as one of the listed products, options on its implied volatility index (VIX). This opened the challenge of developing a pricing framework that can simultaneously handle European options, forward-starts, options on the realized variance and options on the VIX. In this paper we propose a new approach to this problem using spectral methods. We define a stochastic volatility model with jumps and local volatility, which is almost stationary, and calibrate it to the European options on the S&P 500 for a broad range of strikes and maturities. We then extend the model, by lifting the corresponding Markov generator, to keep track of relevant path information, namely the realized variance. The lifted generator is too large a matrix to be diagonalized numerically. We overcome this difficulty by developing a new semi-analytic algorithm for block-diagonalization. This method enables us to evaluate numerically the joint distribution between the underlying stock price and the realized variance which in turn gives us a way of pricing consistently the European options, general accrued variance payoffs as well as forward-starts and VIX options.

Richard Bell

Pricing options using the Gumbel distribution

Abstract: TBA

Ed Hoyle

Geometries of the Brownian bridge with applications to dependence modelling

Abstract: A link is made between increments of a generalised form of the gamma bridge and the multivariate Liouville distribution. A special case of this produces a characterisation of Archimedean copulas. With this as motivation, we turn our attention to a generalised form of the Brownian bridge. The joint distribution of increments of such processes provide a rich class of tractable multivariate distributions. By exploiting certain geometries, we are able to control the tail behaviour of the distributions. The copulas of these distributions may then be suitable for the modelling of the dependences between financial risks.

Hessah Al-Motairi

Irreversible Capacity Expansion with Proportional and Fixed Costs

Abstract: TBA

Simon Fretwell

Asians via Divided Differences

Abstract: This work extends that of Baxter and Brummelhuis (2007), *Functionals of Exponential Brownian Motion and Divided Differences*. Again, we apply classical approximation theory to a fundamental asset-pricing model of mathematical finance. Specifically, we calculate an analytic value for the correlation coefficient between a Lévy-Stable process and its time average, and we find that the use of divided differences greatly elucidates formulae. Further, it can be shown that all moments of the time average may be expressed as divided differences of the exponential function. Taking the case of $\alpha = 2$, we find that the results accord with those obtained using exponential Brownian motion.