

Risk & Stochastics and Financial Mathematics Joint Seminar in 2012

Seminars are listed in reverse chronological order, most recent first.

10 May - Brenda Lopez Cabrera (Humboldt-Universität zu Berlin) **State Price Densities implied from Weather Derivatives**

A State Price Density (SPD) is the density function of a risk neutral equivalent martingale measure for option pricing, and is indispensable for exotic option pricing and portfolio risk management. Many approaches have been proposed in the last two decades to calibrate a SPD using financial options from the bond and equity markets. Among these, non and semi parametric methods were preferred because they can avoid model mis-specification of the underlying and thus give insight into complex portfolio propelling. However, these methods usually require a large data set to achieve desired convergence properties. Despite recent innovations in financial and insurance markets, many markets remain incomplete, and there exists an illiquidity issue. One faces the problem in estimation by e.g. kernel techniques that there are not enough observations locally available. For this situation, we employ a Bayesian quadrature method because it allows us to incorporate prior assumptions on the model parameters and hence avoids problems with data sparsity. It is able to compute the SPD of both call and put options simultaneously, and is particularly robust when the market faces the illiquidity issue. As illustration, we calibrate the SPD for weather derivatives, a classical example of incomplete markets with financial contracts payoffs linked to nontradable assets, namely, weather indices.

3 May - Larbi Alili (Warwick) **On some involutive inversions of one dimensional diffusions**

No title or abstract available

15 March - Josef Teichmann (ETH Zürich) **Finite dimensional realizations for the CNKK-volatility surface model**

We show that parametrizations of volatility surfaces (and even more involved multivariate objects) by time-dependent Lévy processes (as proposed by Carmona-Nadtochiy-Kallsen-Krühner) lead to quite tractable term structure problems. In this context we can then ask whether the corresponding term structure equations allow for (regular) finite dimensional realization, which necessarily leads to models driven by an affine factor process. This is another confirmation that affine processes play a particular role in mathematical finance. The analysis is based on a careful

geometric analysis of the term structure equations by methods from foliation theory.

8 March - Johan Tysk (Uppsala)

No title or abstract available

23 February - Vicky Henderson (Oxford)
Executive Stock Options: Portfolio Effects

Executives compensated with stock options generally receive grants periodically and so on any given date, may have a portfolio of options of differing strikes and maturities on their company's stock. Non-transferability and trading restrictions in the company stock result in the executive facing unhedgeable risk. We employ exponential utility indifference pricing to analyse the optimal exercise thresholds for each option, option values and cost of the options to shareholders. Portfolio interaction effects mean that each of these differ, depending on the composition of the remainder of the portfolio. We demonstrate that the exercise threshold for a particular option can be discontinuous at the time that the option's position in the exercise order changes.

The cost to shareholders of an option portfolio is lowered relative to its cost computed on a per-option basis. The model can explain a number of empirical observations - which options are attractive to exercise first, how exercise changes following a new grant, and early exercise.

Joint work with Jia Sun and Elizabeth Whalley (WBS).

16 February - Mike Tehranchi (Cambridge)
Put-call symmetry and self-duality

We discuss generalisations of the notions of put-call symmetry and self-duality. These notions have found applications in the pricing and hedging of certain path-dependent contingent claims. Our results include a classification of the possible forms of self-duality in one-dimension: in addition to the arithmetic and geometric duality already appearing in the literature, there exists exactly one other type among continuous models. We also give a description of the possible forms of put-call symmetry for common models: in dimension greater than two, interesting new symmetries appear.

9 February - Daniel Hernández (CIMAT)

Dynamic risk measures for exponential Levy market models

The study of robust utility maximization problems for Levy processes is closely related with risk measures. In this talk we shall present recent results on the form of the penalization function associated with risk measures defined in a proper set of absolutely continuous measures, for a Levy market model.

9 February - Markus Riedle (King's College London)

No title or abstract available

2 February - Curdin Ott (Bath)

No title or abstract available

19 January - Damiano Brigo (King's College London)

Arbitrage-free valuation of counterparty credit risk

Although explicit pricing of counterparty credit risk goes way back to 1994 in the financial modelling literature, only after the eight credit events that happened in one month of 2008 the research environment has become increasingly active in modelling credit valuation adjustments (CVA). Basel III is also imposing heavy capital requirements on CVA after noticing that about 2/3 of the losses during the crisis are due to CVA mark to market volatility rather than to actual defaults. In this talk we introduce the mathematics of CVA and explain why it is a difficult hybrid derivatives valuation problem. Subtleties on payoff and modelling mathematics including wrong way risk, closeout conventions, first to default risk, collateral modelling, re-hypothecation and gap risk are investigated with quantitative case studies from a few asset classes. General conclusions on the mathematical difficulties involved in CVA pricing and risk management are presented.

12 January - Johannes Ruf (Oxford)

On the Hedging of Options on Exploding Exchange Rates

Recently strict local martingales have been used to model exchange rates. In such models, put-call parity does not hold if one assumes minimal superreplicating costs as contingent claim prices. I will illustrate how put-call parity can be restored by changing the definition of a contingent claim price. More precisely, I will discuss a change of numeraire technique when the underlying is only a local martingale. Then, the new measure is not necessarily equivalent to the old measure. If one now defines the price of a contingent claim as the minimal superreplicating costs under both measures, then put-call parity holds. I will discuss properties of this new

pricing operator. To illustrate this techniques, I will discuss the class of "Quadratic Normal Volatility" models, which have drawn much attention in the financial industry due to their analytic tractability and flexibility.

This talk is based on joint work with Peter Carr and Travis Fisher.