SEMINARI DE PROBABILITATS
PROBABILITY SEMINAR
Barcelona

Facultat de Matemàtiques, Universitat de Barcelona
Gran Via de les Corts Catalanes, 585; E-08007 Barcelona
Aula/Room IMUB-Facultat de Matemàtiques, 2nd floor
4 p.m.

Titles and abstracts 7-29/03/2006

7/03/2006  Bernt Øksendal, CMA and Departament of Mathematics, University of Oslo, Oslo, Norway
Malliavin calculus for Lévy processes and applications to finance

Abstract: We give an introduction to anticipative stochastic calculus for Lévy processes, including Skorohod integrals, forward integrals, anticipative Itô formulae and Malliavin calculus. Then we present some applications to finance, including

1. minimal variance hedging, and
2. optimal portfolio and consumption of an insider,

in both cases for jump diffusion markets, i.e. markets driven by Lévy processes.

8/03/2006  Bernt Øksendal, CMA and Departament of Mathematics, University of Oslo, Oslo, Norway
Stochastic partial differential equations driven by multi-parameter Lévy white noise

Abstract: We develop a white noise theory for multi-parameter Lévy processes (Lévy fields) and we use this to give a general solution method for SPDEs driven by such fields. Examples include the stochastic heat equation with a (space-time) Lévy white noise heat source and the stochastic wave equation with space-time Lévy white noise initial data.

15/03/2006  Tommi Sottinen, Department of Mathematics and Statistics, University of Helsinki, Helsinki, Finland
On replication and absence of arbitrage in non-semimartingale models

Abstract: (Joint work with Christian Bender and Esko Valkeila) The fundamental theorem of asset pricing states that absence of arbitrage is equivalent to the existence of an equivalent martingale measure. Since semimartingales
are stable under equivalent change of measure, non-semimartingale models have been ruled out for use in mathematical finance by means of this theorem. However, the fundamental theorem depends on the choice of “admissible” strategies. We study a smaller class of strategies which depend on time, the spot of the stock, and a finite number of factors which include the running maximum, minimum, and average of the stock, among others. We call such strategies “allowed”.

We consider a class of models with have the same pathwise quadratic variation. We show that

1. All models are free of arbitrage with allowed strategies provided one admits an equivalent martingale measure.
2. If a continuous payoff functional can be replicated with allowed strategies in one model then it can be replicated with allowed strategies in all models and the hedge is – as a functional of the stock path – independent of the model.

The class of allowed strategies is sufficiently large. E.g. allowed hedges for European, lookback, and Asian options can be constructed via PDE’s.

Our results indicate that path properties, viz. the quadratic variation, is of more importance for pricing than probabilistic properties. Indeed hedges and prices are determined by the quadratic variation which need not be the standard deviation of the log-returns. Moreover, the autocorrelation of the log-returns is irrelevant in pricing and hedging the options.

22/03/2006 Llus Quer-Sardanyons, INRIA Lorraine and Institut lie Cartan, Nancy, France

Abstract: En la primera part d’aquest treball construïm una teoria d’integració de tipus Young en dimensió 2. Això ens permet, en segon lloc, demostrar l’existència i unicitat de solució d’una equació d’ones unidimensional dirigida per un soroll arbitrari tal que els seus increments rectangulares satisfan una certa regularitat de tipus Hőlder, amb exponent més gran que 1/2. Per tal de dur-ho a terme, s’ha considerat un canvi de variables en el domini de definició de l’equació mitjantçant una certa rotació i s’ha aplicat un teorema de punt fix. Finalment, hem aplicat els resultats obtinguts al cas en què les trajectòries que controlen l’equació venen donades pel moviment brownià fraccionari en dimensió infinita i amb paràmetre de Hurst \( H > 1/2 \).

Aquest treball s’ha realitzat conjuntament amb el Samy Tindel.

29/03/2006 Yiming Ding, Wuhan Institute of Physics and Mathematics, Wuhan, China and Centre de Recerca Matemtica, Bellaterra, Spain

The acim of piecewise linear Lorentz maps
In this seminar, I try to show how probability works in deterministic system by typical examples. More precisely, we consider the stochastic behaviors of a family of Lorenz maps with three parameters:

\[ S_{a,b,c}(x) = \begin{cases} 
ax + 1 - ac & x \in [0, c) \\
b(x - c) & x \in [c, 1]. 
\end{cases} \]

We will discuss the following topics:

- when \( S_{a,b,c} \) admits an acim (absolutely continuous invariant measure with respect to the Lebesgue measure);
- when the acim is equivalent to the Lebesgue measure;
- in which sense the acim is stable;
- rate of convergence: decay of correlations, central limit theorem, large deviation, \( \cdots \).

The materials will be arranged carefully so that the seminar is accessible to probabilist.