

SEMINARI DE PROBABILITATS

PROBABILITY SEMINAR

Universitat de Barcelona–Universitat Autònoma de Barcelona

Titles and abstracts for the academic year 2008-2009

01/10/2008 Eddy Mayer-Wolf, Technion, Israel.

Correlation Inequalities in Wiener Space.

Abstract We present a number of correlation inequalities in finite or infinite dimensional Gaussian spaces involving suitably monotone, convex or log-concave functionals, which are presented in a unified manner as direct consequences of a suitable covariance expansion in terms of the Ornstein-Uhlenbeck semigroup. This is joint work with A.S. Ustunel and M. Zakai.

08/10/2008 Sebastian del Baño, CRM, Bellaterra, Spain.

Spot inversions in the Heston models.

Abstract We analyse the Heston stochastic volatility model under an inversion of spot. The result is that under the appropriate measure changes the resulting process is again a Heston type process whose parameters can be explicitly determined from those of the original process. This behaviour can be interpreted as some measure of 'sanity' of Heston model but does not seem to be a general feature of stochastic volatility processes.

29/10/2008 Josep Vives, Universitat de Barcelona, Spain.

An anticipating Itô formula for Lévy processes.

Abstract In this paper, we use the Malliavin calculus techniques to obtain an anticipative version of the change of variable formula for Lévy processes. Here the coefficients are in the domain of the annihilation (gradient) operator in the 'future sense', which includes the family of all adapted and square-integrable processes. This domain was introduced on the Wiener space by Alòs and Nualart (1998). Therefore, our Itô formula is not only an extension of the usual adapted formula for Lévy processes, but also an extension of the anticipative version on Wiener space obtained in Alòs and Nualart (1998).

05/11/2008 Marta Sanz-Solé, Universitat de Barcelona, Spain.

Hitting probabilities for stochastic waves.

Abstract For \mathbb{R}^d -valued stochastic processes $\{v(x), x \in \mathbb{R}^m\}$, we shall discuss conditions providing lower and upper bounds for the hitting probabilities $P\{v(I) \cap A \neq \emptyset\}$ in terms of the capacity and the Hausdorff measure of A , respectively. Applications to the stochastic wave equation with additive correlated noise will be given. The results are part of ongoing work with R. Dalang.

12/11/2008 Sebastian del Baño, CRM, Bellaterra, Spain.

Some considerations in the trading of exotic options.

Abstract We present some of the real life features of the FX spot and derivatives market and show some consequences these have in the mathematical modelling of the market.

19/12/2008 Arturo Kohatsu-Higa, Osaka University, Japan.

An Operator Approach for Markov Chain Weak Approximations with an Application to Infinite Activity Levy Driven SDEs.

Abstract Weak approximations have been developed to calculate the expectation value of functionals of stochastic differential equations, and various numerical discretization schemes (Euler, Milstein) have been studied by many authors. We present a general framework based on semigroup expansions for the construction of higher order discretization schemes and analyze its rate of convergence. We also apply it to approximate general Lévy driven stochastic differential equations.

19/12/2008 Giovanni Peccati, Université Paris Ouest, Nanterre La Défense, France.

Weak convergence on the Poisson space: decoupling, Stein's method and low influences.

Abstract We will describe how to obtain limit theorems for non-linear functionals of a Poisson measure, by combining Malliavin calculus, decoupling and Stein's method. We will evoke some applications to prior specification in Bayesian nonparametric survival analysis. Also, we will enlight some links with the notion of "kernel with low influences", which is a concept related to invariance principles for polynomial functionals of i.i.d. sequences. The core of the talk is based on a joint work with J.-L. Solé, F. Utzet and M.S. Taqqu.

07/01/2009 Eulàlia Nualart, Université Paris 13, Villetaneuse, France.

Minoració de la densitat d'una variable aleatòria no degenerada en l'espai de Wiener.

Abstract Obtenim una minoració de la densitat d'una variable aleatòria d-dimensional no degenerada en l'espai de Wiener sota una condició del moment exponencial de la divergència de covering vector fields". Aquest treball ha estat realitzat conjuntament amb el Professor Paul Malliavin.

14/01/2009 Mario Wschebor, Universidad de la República, Uruguay.

The distribution of the maximum of a real-valued random field. Second order proprieties.

Abstract Let $\chi := \{X(t); t \in S\}$ be a real-valued random field on some parametre set S , and $M := \sup_{t \in S} X(t)$ its supremum.

For Gaussian processes, a number of basic inequalities for $P(M > u)$ have been known since the 1970's (Dudley, Landau-Shepp, Fernique, Borell, Sudakov-Tsirelson). These are essential for the development of most of the mathematical theory. However, in a wide number of applications, the general situation is that these inequalities are not good enough, since they

depend on certain constants that one is unable to estimate or for which estimations differ substantially from the true values and also, they are very inaccurate for certain classes of processes.

Since the 1990's several methods have been introduced with the aim of obtaining more precise results than those arising from the classical theory, at least under certain restrictions on the process χ . These results are interesting both from the standpoint of the mathematical theory and of their use in significant applications. The restrictions on χ include the requirement that the domain S have some finite-dimensional geometrical structure and the paths of the random field, a certain regularity.

More precisely, one wants to write, whenever it is possible,

$$P(M > u) = A(u) \exp\left(-\frac{1}{2} \frac{u^2}{\sigma^2}\right) + B(u) \quad (1)$$

where $A(u)$ is a known function having polynomially bounded growth as $u \rightarrow +\infty$, $\sigma^2 = \sup_{t \in S} \text{Var}(X(t))$ and $B(u)$ is an error bounded by a centered Gaussian density with variance $\sigma_1^2, \sigma_1^2 < \sigma^2$. We will call the first (respectively the second) term in the right-hand side of (1) the 'first (resp second) order approximation of $P(M > u)$.'

The aim of the talk is to present recent results with more precise approximations of the tails of the distribution of the random variable M . We will be especially interested in the approximation of $P(M > u)$ for large u , but we also give results that can be used for all u . The content of the talk is a part of Chapters 7 and 8 of the book 'Level sets and extrema of random processes and fields' by Jean-Marc Azaïs and Mario Wschebor, John Wiley and Sons, to appear in March 2009.