Michael Tehranchi (University of Cambridge)

“An HJM approach to equity derivatives”

Abstract: There has been recent interest in applying the Heath-Jarrow-Morton interest rate framework to other areas of financial modelling. Unfortunately, there are serious technical challenges in implementing the approach for modelling the dynamics of the implied volatility surface of a given stock. By a suitable change of parametrisation, we derive an HJM-style SPDE and discuss its existence theory. We survey some recent negative results to illustrate some of the technical challenges.

Olivier Menoukeu-Pamen (University of Liverpool)

“Maximum principles of Markov regime-switching forward-backward stochastic differential equations with jumps and partial information”

Abstract. This paper presents three versions of maximum principle for a stochastic optimal control problem of Markov regime-switching forward-backward stochastic differential equations with jumps (FBSDEJs). A general sufficient maximum principle for optimal control for a system driven by a Markov regime-switching forward and backward jump-diffusion model is developed. After, an equivalent maximum principle is proved. Malliavin calculus is employed to derive a general stochastic maximum principle for non-Markovian system. The latter does not required concavity of Hamiltonian. Applications of the stochastic maximum principle to non-concave Hamiltonian and recursive utility maximization are also discussed.

Albert Ferreiro-Castilla (Queen Mary University, London)

"Euler-Poisson schemes for Lévy processes"

Abstract: In this talk we will contextualize the recently established Wiener-Hopf Monte Carlo (WHMC) simulation technique for Levy processes from Kuznetsov et al. [4] into a more general framework allowing us to use the same technique in a larger set of problems. We will briefly show how the scheme can be used to approximate Levy driven SDEs, be enhanced with a multilevel Monte Carlo scheme, or approximate different types of path-quantities.

References

[1] Ferreiro-Castilla, A., Kyprianou, A.E., Scheichl, R. and Suryanarayana, G. (2013) Multi-llevel Monte Carlo simulation for Levy processes based on the Wiener-Hopf factorization. Stoch. Proc. Appl. (To appear)

[2] Ferreiro-Castilla, A., Kyprianou, A.E. and Scheichl, R. (2013) An Euler-Poisson scheme for numerical approximation of Levy driven SDEs. Preprint. http://arxiv.org/abs/1309.1839

[3] Ferreiro-Castilla, A. and van Schaik, K. (2013) Applying the Wiener-Hopf Monte Carlo simulation technique for Levy processes to path functionals. J. Appl. Probab. (To appear)

[4] Kuznetsov, A., Kyprianou, A.E., Pardo, J.C. and van Schaik, K. (2011) A Wiener-Hopf Monte Carlo simulation technique for Lévy process. Ann. App. Probab. 21 (6), 2171-2190.

M.D. Ruiz-Medina (Universidad de Granada)

“Cox-Ingersoll-Ross model in infinite-dimensional spaces”

Abstract: Infinite-dimensional Chi-squared distributions in the central and non-central case are introduced through their characteristic functional (see, for example, Proposition 1.2.8 of Da Prato and Zabczyk (2002). Conditions for their decomposition in terms of infinite sums of independent real-valued central and non-central Chi-squared distributions are respectively derived. These results are applied to obtaining orthogonal systems with respect to such infinite-dimensional probability measures. In particular, in the recurrent case, the space L^2(H; B(H)) generated by the invariant distribution of Cox-Ingersoll-Ross Model in Hilbert spaces (i.e., for Hilbert-valued random variables) is orthogonally decomposed.

References: Da Prato, G. and Zabczyk, J. (2002) Second Order Partial Differential Equations in Hilbert Spaces. Cambridge University Press, Cambridge.

Steffen Sjursen (University of Oslo)

“BSDEs and optimal control for time-changed Lévy processes”

Abstract: We study backward stochastic differential equations (BSDE's) for time-changed Lévy noises when the time-change is independent of the Lévy process. We prove existence and uniqueness of the solution and we obtain an explicit formula for linear BSDE's and a comparison principle. BSDE's naturally appear in control problems. Here we prove sufficient and necessary maximum principles for a general optimal control problem of a system driven by a time-changed Lévy noise. As an application we solve the mean-variance portfolio selection problem.

Author: Elisa Alòs (UPF)

“On the closed-form approximation of short-time random strike options”

Abstract: we propose a general technique to develop first and second order closed-form approximation formulas for short-time options with random strikes. Our method is based on Malliavin calculus techniques and allows us to obtain simple closed-form approximation formulas depending on the derivative operator. The numerical analysis shows that these formulas are extremely accurate and improve some previous approaches on two-assets and three-assets spread options as Kirk's formula or the decomposition method presented in Alòs, Eydeland and Laurence (2011).

Anthony Reveillac (CEREMADE-Université Paris-Dauphine)

"Non-classical BSDEs arising in the utility maximization problem with random horizon"

Abstract: "In this talk we will present a class of non-standard BSDE which come into play in the context of the utility maximization problem with random horizon.

We will explain in which sense these equations do not belong to the classical theory, and we will present existence and uniqueness type results for them.

This talk is based on a joint work with Monique Jeanblanc and Nam Hai Nguyen."

Asma Kheder (Technische Universitët München)

"Weak stationarity of Ornstein-Uhlenbeck processes with stochastic speed of mean reversion"

Abstract: When modeling energy prices with the Ornstein-Uhlenbeck process, it was shown in Barlow, Gusev, and Lai [1] and Zapranis and Alexandris [2] that there is a large uncertainty attached to the estimation of the speed of mean-reversion and that it is not constant but may vary considerably over time. In this paper we generalize the Ornstein-Uhlenbeck process to allow for the speed of mean reversion to be stochastic. We suppose that the mean-reversion is a Brownian stationary process. We apply Malliavin calculus in our computations and we show that this generalized Ornstein-Uhlenbeck process is stationary in the weak sense. Moreover we compute the instantaneous rate of change in the mean and in the squared fluctuations of the generalized Ornstein-Uhlenbeck process given its initial position. Finally, we derive the chaos expansion of this generalized Ornstein-Uhlenbeck process.

(Joint work with Fred Espen Benth)

References

[1] Barlow, M., Gusev. Y., and Lai, M. (2004). Calibration of multifactor models in electricity markets. Intern. J. Theoret. Appl. Finance, 7, (2), pp. 101{120.

[2] Zapranis, A., and Alexandridis, A. (2008). Modelling the temperature time-dependent speed of mean reversion in the context of weather derivatives pricing. Appl. Math. Finance 15(4), pp. 355{386.

Salvador Ortiz-Latorre (CMA, University of Oslo)

“A pricing measure to explain the risk premium in power markets”

Abstract: In electricity markets, it is sensible to use a two-factor model with mean reversion for spot prices. One of the factors is an Ornstein-Uhlenbeck (OU) process driven by a Brownian motion and accounts for the small variations. The other factor is an OU process driven by a pure jump Lévy process and models the characteristic spikes observed in such markets. When it comes to pricing, a popular choice of pricing measure is given by the Esscher transform that preserves the probabilistic structure of the driving Lévy processes, while changing the levels of mean reversion. Using this choice one can generate stochastic risk premiums (in geometric spot models) but with (deterministically) changing sign. In this talk we introduce a pricing change of measure, which is an extension of the Esscher transform. With this new change of measure we also can slow down the speed of mean reversion and generate stochastic risk premiums with stochastic non constant sign, even in arithmetic spot models. In particular, we can generate risk profiles with positive values in the short end of the forward curve and negative values in the long end. Finally, our pricing measure allows us to have a stationary spot dynamics while still having randomly fluctuating forward prices for contracts far from maturity.

Thibaut Mastrolia (CEREMADE-Université Paris-Dauphine)

“Density analysis of BSDEs”

Abstract: In this paper we investigate existence and smoothness of densities for the solution of Backward Stochastic Differentia Equations. This question has been very few studied in the literature and the existing results mainly focus on the Y component. In this talk, we will focus on the Z component since it finds applications in Finance. Our approach relies on the Malliavin calculus and on BSDEs techniques. This talk is based on a work in progress with Dylan Possamaï and Anthony Réveillac.

Lluis Quer-Sardanyons (UAB)

“Gaussian upper density estimates for spatially homogeneous SPDEs”

Abstract: We consider a general class of SPDEs in R^d driven by a Gaussian spatially homogeneous noise which is white in time. We provide sufficient conditions on the coefficients and the spectral measure associated to the noise ensuring that the density of the corresponding mild solution admits an upper estimate of Gaussian type. The proof is based on the formula for the density arising from the integration-by-parts formula of the Malliavin calculus. Our result applies to the stochastic heat equation with any space dimension and the stochastic wave equation with d in {1,2,3}. In these particular cases, the condition on the spectral measure turns out to be optimal.