



Minisymposium 14 - Stochastische Marktmodelle

Malliavin differentiability of the Heston Volatility and an extension of of the Hull and White pricing formula

CHRISTIAN-OLIVER EWALD (UNIVERSITY OF LEEDS)

The talk is based on results obtained jointly with Elisa Alos, UPF Barcelona. We show that the Heston volatility or equivalently the Cox-Ingersoll-Ross process satisfying

$$dv_t = \kappa(\theta - v_t) dt + \nu\sqrt{v_t}dW_t$$

is Malliavin differentiable and give an explicit expression for the derivative. This result assures the applicability of Malliavin calculus in the framework of the Heston stochastic volatility model and the Cox-Ingersoll-Ross model for interest rates. Furthermore we derive conditions on the parameters κ, θ and ν which guarantee the existence of the second Malliavin derivative of the Heston volatility. We apply this result in order to obtain an extension of the classical Hull and White formula to the Heston model with correlation and derive an approximate option pricing formula. Our numerical experiments document that the approximation delivers excellent results.