

Michael Monoyios:

Malliavin calculus method for asymptotic expansion of dual control problems

We develop a technique based on Malliavin calculus ideas, for asymptotic expansion of dual control problems arising in connection with exponential indifference valuation of claims, and with minimisation of relative entropy, in incomplete markets. The problems involve optimisation of a functional in which the control features quadratically, while in the state dynamics it appears as a drift perturbation to Brownian paths on Wiener space. This drift is interpreted as a measure change using the Girsanov theorem, leading to a form of the integration by parts formula in which a directional derivative on Wiener space is computed. This allows for asymptotic analysis of the control problem.

Applications to incomplete It^o process markets are given, in which indifference prices are approximated in the low risk aversion limit. We also give an application to identifying the minimal entropy martingale measure as a perturbation to the minimal martingale measure in stochastic volatility models.