

STOCHASTIC CALCULUS VIA REGULARIZATION AND ONE APPLICATION TO MATHEMATICAL FINANCE

FRANSESCO RUSSO

ABSTRACT

Stochastic calculus via regularization (started by F.R and P. Vallois in 1991) is an approach of stochastic calculus beyond Itô calculus which has the following features: it constitutes a bridge between causal and non-causal calculus, it is suitable when the integrator is a non-semimartingale and it behaves similarly to a pathwise integral. It has applications in mathematical finance, fluid dynamics and irregular random media. In the first part of the talk (tutorial) we will recall the basic properties and the relations to Malliavin calculus. We will provide then a class of significant finite quadratic processes. Some comments about recent work (jointly with C. Di Girolami) on infinite dimensional extensions will be provided.

In the second part of the talk some applications to basic mathematical finance will be discussed, corresponding to joint work with R. Coviello and C. Di Girolami. The stochastic integral intervening in the definition of self-financing property is forward integral (by regularisation). If one requires that a certain minimal class of investor strategies are self-financing, previous prices are forced to be finite quadratic variation processes. The non-arbitrage property is not excluded if the class \mathcal{A} of admissible strategies is restricted. The classical notion of martingale is replaced with the notion of \mathcal{A} -martingale. A calculus related to \mathcal{A} -martingales with some examples is developed. Some applications to no-arbitrage, viability, hedging and the maximization of the utility of an insider are expanded. Hedging of path dependent options when the underlying is a finite quadratic variation process will be mentioned.

INRIA ROCQUENCOURT AND UNIVERSITÉ PARIS 13

E-mail address: russo@math.univ-paris13.fr