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## Abstract

The purpose of this paper is to develop a fractional white noise calculus and to apply this to markets modeled by (Wick-) Itô type of stochastic differential equations driven by fractional Brownian motion  $B_H(t)$ ;  $1/2 < H < 1$ .

We show that if we use an Itô type of stochastic integration with respect to  $B_H(t)$  (as developed in Ref. 8), then the corresponding *Itô fractional Black-Scholes market has no arbitrage*, contrary to the situation when the pathwise integration is used. Moreover, we prove that our Itô fractional Black-Scholes market is complete and we compute explicitly the price and replicating portfolio of a European option in this market. The results are compared to the classical results based on standard Brownian motion  $B(t)$ .

**Keywords:** Fractional Brownian motions ▪ fractional white noises ▪ chaos expansion ▪ Wick calculus ▪ Fractal Black-Scholes market ▪ arbitrage ▪ price formula ▪ replicating portfolio

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