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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

AMSC: Primary 60H40, Primary 60H05, Primary 60G15, Secondary 91B28





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