

Derivation of Fractional Black-Scholes Equations Driven by Fractional G-Brownian Motion and Their Application in European Option Pricing

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Abstract : In this paper, fractional Black-Scholes models for the European option pricing were established based on the fractional G-Brownian motion (fGBm), which generalizes the concepts of the classical Brownian motion, fractional Brownian motion and the G-Brownian motion, and that can be used to be a tool for considering the long range dependence and uncertain volatility for the financial markets simultaneously. A generalized fractional Black-Scholes equation (FBSE) was derived by using the Taylor's series of fractional order and the theory of absence of arbitrage. Finally, some explicit option pricing formulas for the European call option and put option under the FBSE were also solved, which extended the classical option pricing formulas given by F. Black and M. Scholes.

Keywords : European option pricing, fractional Black-Scholes equations, fractional g-Brownian motion, Taylor's series of fractional order, uncertain volatility

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