



Special Issue Reprint

Application of Fractal Processes and Fractional Derivatives in Finance

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In recent years, there has been a fast growth in the application of long-memory processes to underlying assets including stock, volatility index, exchange rate, etc. The fractional Brownian motion is the most popular of the long-memory processes and was introduced by Kolmogorov in 1940 and later by Mandelbrot in 1965. It has been used in hydrology and climatology as well as finance. The dynamics of the volatility of asset price or asset price itself were modelled as a fractional Brownian motion in finance and are called rough volatility models and the fractional Black–Scholes model, respectively. Fractional diffusion processes are also used to model the dynamics of underlying assets. The option price under the fractional diffusion setting induces fractional partial differential equations involving the fractional derivatives with respect to the time and the space, respectively. Some closed-form solutions might be found via transform methods in some cases of applications, and numerical methods to solve fractional partial differential equations are being developed. This Special Issue focuses on empirical studies as well as option pricing. The empirical studies consist of multifractal analyses of stock market and volatility index. Multifractal analyses include cross-correlation multifractal analysis, multifractal detrended fluctuation analysis, and other fractional analyses. Meanwhile, option pricing focuses on the fractional Black–Scholes models and their variants, including the fuzzy fractional Black–Scholes model, uncertain fractional differential equation, and model with fractional-order feature.



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