

عنوان مقاله:

A compact difference scheme for time-fractional Black-Scholes equation with time-dependent parameters under the CEV model: American options

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خلاصه مقاله:

The Black-Scholes equation is one of the most important mathematical models in option pricing theory, but this model is far from market realities and cannot show memory effect in the financial market. This paper investigates an American option based on a time-fractional Black-Scholes equation under the constant elasticity of variance (CEV) model, which parameters of interest rate and dividend yield supposed as deterministic functions of time, and the price change of the underlying asset follows a fractal transmission system. This model does not have a closed-form solution; hence, we numerically price the American option by using a compact difference scheme. Also, we compare the time-fractional Black-Scholes equation under the CEV model with its generalized Black-Scholes model as $\alpha = 1$ and $\beta = \infty$. Moreover, we demonstrate that the introduced difference scheme is unconditionally stable and convergent using Fourier analysis. The numerical examples illustrate the efficiency and accuracy of the introduced difference scheme.

کلمات کلیدی:

CEV model, Time-dependent parameters, Option pricing, American option, Fractional BlackScholes equation, Compact difference scheme

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