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# Pricing European Options under Jump Diffusion Models with Fast L-stable Padé Scheme

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**Abstract :** The goal of option pricing theory is to help the investors to manage their money, enhance returns and control their financial future by theoretically valuing their options. Modeling option pricing by Black-School models with jumps guarantees to consider the market movement. However, only numerical methods can solve this model. Furthermore, not all the numerical methods are efficient to solve these models because they have nonsmoothing payoffs or discontinuous derivatives at the exercise price. In this paper, the exponential time differencing (ETD) method is applied for solving partial integrodifferential equations arising in pricing European options under Merton’s and Kou’s jump-diffusion models. Fast Fourier Transform (FFT) algorithm is used as a matrix-vector multiplication solver, which reduces the complexity from O(M2) into O(M logM). A partial fraction form of Pad`e schemes is used to overcome the complexity of inverting polynomial of matrices. These two tools guarantee to get efficient and accurate numerical solutions. We construct a parallel and easy to implement a version of the numerical scheme. Numerical experiments are given to show how fast and accurate is our scheme.

**Keywords :** Integral differential equations,, L-stable methods, pricing European options, Jump–diffusion model
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