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Robust Numerical Scheme for Pricing American Options under Jump Diffusion Models

Authors : Salah Alrabeei, Mohammad Yousuf

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. However, most of the option pricing models have no analytical solution. 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, we solve the American option under jump diffusion models by using efficient time-dependent numerical methods. several techniques are integrated to reduced the overcome the computational complexity. Fast Fourier Transform (FFT) algorithm is used as a matrix-vector multiplication solver, which reduces the complexity from O(M2) into O(M logM). Partial fraction decomposition technique is applied to rational approximation schemes to overcome the complexity of inverting polynomial of matrices. The proposed method is easy to implement on serial or parallel versions. Numerical results are presented to prove the accuracy and efficiency of the proposed method.

Keywords : integral differential equations, jump–diffusion model, American options, rational approximation
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