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On American Options Under the Variance Gamma Process

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Abstract

American options are considered in a market where the underlying asset follows a Variance Gamma process. A sufficient condition is given for the failure of the smooth fit principle for finite horizon call options. A second-order accurate finite-difference method is proposed to find the American option price and the exercise boundary. The problem is formulated as a Linear Complementarity Problem and solved numerically by a convenient splitting. Computations have been accelerated with the help of the Fast Fourier Transform. A stability analysis shows that the scheme is conditionally stable, with a mild stability condition of the form $k = O(|\log(h)|^{-1})$. The theoretical results are verified numerically throughout a series of numerical experiments.

Keywords:

Integro-differential equations | variance gamma | finite differences | FFT

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