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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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