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A Wiener-Hopf Monte-Carlo simulation technique for Levy processes

We develop a completely new and straightforward method for simulating the joint law of the position and running maximum at a fixed time of a general Levy process with a view to application in insurance and financial mathematics. Although different, our method takes lessons from Carr's so-called 'Canadization' technique as well as Doney's method of stochastic bounds for Levy processes. We rely fundamentally on the Wiener-Hopf decomposition for Levy processes as well as taking advantage of recent developments in factorization techniques. We illustrate our Wiener-Hopf Monte-Carlo method on a number of different processes. Moreover, we illustrate the robustness of working with a Wiener-Hopf decomposition with two extensions. The first extension shows that if one can successfully simulate for a given Levy processes then one can successfully simulate for any independent sum of the latter process and a compound Poisson process. The second extension illustrates how one may produce a straightforward approximation for simulating the two sided exit problem.

This is joint work with A.E. Kyprianou, J.C. Pardo and K. van Schaik.