Mathematics > Probability

Extended Factorizations of Exponential Functionals of Lévy Processes

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In [16], under mild conditions, a Wiener-Hopf type factorization is derived for the exponential functional of proper L\'evy processes. In this paper, we extend this factorization by relaxing a finite moment assumption as well as by considering the exponential functional for killed L\'evy processes. As a by-product, we derive some interesting new distributional properties enjoyed by a large class of this random variable, such as the absolute continuity of its distribution and the smoothness, boundedness or complete monotonicity of its density. This type of results is then used to derive similar properties for the law of maxima and first passage time of some stable L\'evy processes. Thus, for example, we show that for a large class of stable processes the first passage time has a bounded and non-increasing density on the positive half-line. We also generate many instances of integral or power series representations for the law of the exponential functional of L\'evy processes with one or two-sided jumps. The proof of our main results requires different devices from the one developed in [16]. It relies in particular on a generalization of a transform recently introduced in [8] together with some extensions to killed L\'evy process of Wiener-Hopf techniques.

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