A VARIATION OF THE CANADISATION ALGORITHM FOR THE PRICING OF AMERICAN OPTIONS DRIVEN BY LÉVY PROCESSES

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Theorem 1. *We consider a classic optimal stopping problem driven by a Lévy process with finite horizon. This problem can be interpreted as yielding the value and optimal exercise time of an American option in an extension of the classic Black & Scholes model to a model where the price of the risk asset is driven by a Lévy process. As it is well known typically no closed form solution for such problems exist and hence numerical methods are required. To this end we introduce a new algorithm, which is based on Carr's 'Canadisation' technique, cf.* [2] *(see also* [1]*). We prove the convergence of the algorithm, and we work it out in detail for the classic example of an American put option driven by a meromorphic Lévy process. The latter is a large class of Lévy processes recently introduced in* [4] *(see also* [3]*). Their main appeal is that their Wiener-Hopf factors are explicit (possibly infinite) mixtures of exponentials. This also yields an explicit expression as a (possibly infinite) mixture of exponentials for the law of the Lévy process evaluated at an independent, exponentially distributed time. This latter property is the key point in our new algorithm and yields in the case of an American put an approximation of the value function in terms of elementary functions. We illustrate the results with some numerics.*

References

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