Approximations for SDEs Driven by Lévy Processes

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Weak approximations have been developed to calculate the expectation value of functionals of stochastic differential equations, and various numerical discretization schemes (Euler, Milshtein) have been studied by many authors. We present first an error study of a scheme with random time partition for SDE's driven by pure jump Lévy processes which shows that due to the concentration of jumps around zero one can define schemes with fast convergence rate. On the other hand, we define other schemes that consider few jumps which combined with Euler-like schemes lead to methods where the error due to each approximation (Brownian and jump part) contribute the same to the error. In order to do this, we study an operator decomposition method applicable to jump driven SDEs. This leads to alternative schemes and a clear decomposition of the error analysis.