

Efficient Simulation of Affine Volterra Processes: From Heston to Hawkes

Based on joint works with Elie Attal and Dimitri Sotnikov.

We propose simple and efficient schemes for Affine Volterra processes, using integrated kernel quantities and the Inverse Gaussian distribution. The schemes preserve positivity, and can be shown to converge weakly by recasting them as stochastic Volterra equations with a measure-valued kernel. Our method applies to two important examples: Volterra square-root/Heston and Hawkes processes. In the first case, when using a fractional kernel, the scheme with large time steps seems to be more performant as the Hurst index H decreases to $-1/2$. In the second case, our scheme has deterministic complexity, in contrast with exact methods based on sampling jump times that have random complexity, which opens the door to efficient Monte Carlo methods.