

## Unified moment-based simulation of multivariate polynomial processes and applications in financial engineering

**ABSTRACT:** Polynomial processes are a class of Markov processes which have the property that moments can be computed easily and efficiently by computing the exponential of a matrix. In this paper, we propose a general simulation scheme for multivariate polynomial processes. The methodology is based on the approximate computation of conditional moments given joint moments and on performing random sampling given such conditional moments. The general methodology can be adapted to the simulation of many stochastic models of practical relevance in financial engineering. It turns out to be very useful because it can be applied to stochastic volatility models (for example, the Jacobi model) and commodity price models (for example, the Pilipovi{'c} model), for which semi-analytical European options pricing formulas (e.g., FFT or COS methods) or exact simulation schemes are not available, rendering it necessary to use approximations. We compare the proposed simulation schemes against various benchmarks and find that the new methodology improves the runtime/accuracy performances with respect to existing methods.