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Automatic differentiation for stochastic processes

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Automatic Differentiation (AD) techniques allows to determine the Taylor expansion of any deterministic function. The generalization of these techniques to stochastic problems is not trivial. In this work we explore two approaches to extend the ideas of AD to stochastic processes, one based on reweighting and another one based on the ideas of numerical stochastic perturbation theory using the Hamiltonian formalism. We show that, when convergence can be guaranteed, the approach based on NSPT is able to converge to the Taylor expansion with a much smaller variance.

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