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Toward real-time pricing of complex financial derivatives

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Abstract

In this paper, we investigate the feasibility of using low-discrepancy sequences to allow complex derivatives, such as mortgage-backed securities (MBSs) and exotic options, to be calculated considerably faster than is possible by using conventional Monte Carlo methods. In our experiments, we examine classical classes of low-discrepancy sequences, such as Halton, Sobol', and Faure sequences, as well as the very recent class called generalized Niederreiter sequences, in the light of the actual convergence rate of numerical integration with practical numbers of dimensions. Our results show that for the problems of pricing financial derivatives that we tested: (1) generalized Niederreiter sequences perform markedly better than both classical sequences and Monte Carlo methods; and (2) classical low-discrepancy sequences often perform worse than Monte Carlo methods. Finally, we discuss several important research issues from both practical and theoretical viewpoints.

Keywords:

low-discrepancy sequences | generalized Niederreiter sequences | Faure sequences | Sobol' sequences | financial derivatives

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