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New acceleration schemes with the asymptotic expansion in Monte Carlo simulation

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Abstract. In the present paper, we propose a new computational technique with the Asymptotic Expansion (AE) approach to achieve variance reduction of the Monte-Carlo integration appearing especially in finance. We extend the algorithm developed by Takahashi and Yoshida (2003) to the second order asymptotics. Moreover, we apply the AE to approximate time dependent differentials of the target value in Newton (1994)'s scheme. Our numerical examples include pricing of average and basket options when the underlying state variables follow Constant Elasticity of Variance (CEV) processes.