A Central Limit Theorem for a Hybrid-Monte Carlo Method

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Quasi-Monte Carlo (QMC) methods outperform Monte Carlo (MC) methods when the dimension of the problem is not too large. In the opposite situation, the so-called mixed method [2,4], where a small number of coordinates are sampled using QMC points and the rest sampled using random points, has been shown to significantly reduce the error, especially in problems with small effective dimension [1]. We present a central limit theorem for the mixed method, and obtain its asymptotic variance. As a corollary, we compute the variance reduction obtained by the mixed method relative to the MC method. We then compare the efficiency (which combines the variance, bias, and computation time) of the mixed method with the efficiency of MC and another hybrid method which combines randomized QMC points with random points [3], when these methods are applied to problems from numerical integration and finance.

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