Efficient Simulation and Approximation of Value at Risk under GARCH Model

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Abstract

In this paper, we consider using flexible and elastic Monte Carlo simulation to evaluate the Value-at-Risk (VaR) under the GARCH model. The interesting event probabilities considered in VaR typically are of moderate deviations. We develop a new moderate deviations method and propose an algorithm for VaR computation. Use importance sampling to reduce the high computational cost problem of Monte Carlo simulation method and improve the computational efficiency of Monte Carlo simulation. The results are confirmed by a simulation study. Empirically, we can evaluate the daily VaR of DAX30 and FTSE250 index and a portfolio of three stocks. In back-testing, compare the efficiency of model with Delta-Normal method and the historical simulation method. The proposed method is consistently more efficient than other methods.

Key words: Importance sampling, moderate deviation, Delta-Normal method, historical simulation method.