Abstract

The main purpose of this project is to study a board set of Monte Carlo methods and their application to approximation of financial derivatives: options. Monte Carlo methods are commonly used in order to understand the effect of risks. In other words, the methods are popular tools in mathematical finance to analyse complex instruments. The methods were studied in detail, applied to approximation problems and illustrated in examples. Analysis was available for every example, discussing pros and cons of each method. In the end, all of the methods were compared and discussed based on their performance in the simulations.

Two types of options were discussed: vanilla options and barrier options (single barrier and monitored in discrete time manners). Monte Carlo methods discussed were: Naive Monte Carlo method and the antithetic variates method in chapter 2, variance reduction technique: importance sampling in chapter 3, and Sequential Monte Carlo methods in static and dynamic ways, and adaptive Sequential Monte Carlo method in chapter 4.