

## Abstract

This project has presented a general overview of methods for option pricing via Sequential Monte Carlo (SMC) methods, namely, to estimate complex integrals by the mean of the numerical approaches based on simulation. To show the potential application of SMC in the financial industry, the thesis focuses on the study of evaluating the Discrete Barrier Option, for which the analytic solution remains unknown so far, by the virtue of its efficient and steady performance when dealing with high-dimensional integrals.

In this thesis, approximation of European Vanilla Call option price by the Basic Monte Carlo methods are used for illustration of solving option pricing problem. Then, the problem will be extended to high-dimensional space, that is, evaluation of path-dependent option – Barrier option, followed by some alternative numerical strategy: the Sequential Importance Sampling and the Sequential Importance Resampling. Simulation results and theoretical proofs are presented for the analysis purpose of pros and cons.

For this whole project, all simulations are conducted by the statistical software Rstudio ([R Core Team, 2012](#)).