Abstract

This paper focuses on using Monte-Carlo Integration to estimate the prices of Vanilla and Barrier options. The options mentioned in this paper are modeled after the well-known Black-Scholes Model. Although the Black-Scholes Model has a straightforward formula to calculate the exact price of a Vanilla option, it is not the case for Barrier options. As such, we turn to the mathematical form for Barrier options which comes in the form of an integral.

Unfortunately, the integral for Barrier options is not analytically computable. Numerical methods such as Monte-Carlo Integration have to be employed to estimate the Barrier option Integral. To convince ourselves that Monte-Carlo Integration is indeed reliable, we use it to estimate the price of a Vanilla option and compare it with the price derived from the Black-Scholes formula. Following which, we will use Monte-Carlo Integration to estimate Barrier option prices proper.

As Monte-Carlo Integration can only estimate the price of the option, accuracy and vari- ability of this estimate becomes a point of concern. Slightly more complex techniques such as Importance Sampling will be employed in an attempt to reduce the variability of the estimate. Throughout the paper, there will be a great deal of emphasis placed on evaluating the accuracy of the Monte-Carlo estimator to justify its usage.