

MATH 477: PROJECTS

1. PRICING AN ASIAN OPTION BY MONTE CARLO METHODS

Consider an Asian option that pays $\left(\frac{1}{D}(S_d(1) + \dots + S_d(D)) - K\right)^+$, where $S_d(i)$ is the share price at the end of the i th day.

Write code to implement a function that does a single run. The arguments to the function should be: s , the initial share price; D the time (measured in days); K , the strike price; r , the interested rate (annual rate, continuously compounded); and σ , the volatility of the stock.

Each time the function is called, it should return the value from a single realization of $S(t)$ (as a GBM with the risk-neutral distribution).

Write another function to collect a large number of these values, and to find the sample mean and variance.

Price an Asian option on a share with initial price \$61, strike price \$63, volatility 0.3, and interest rate 8% over 6 months. How accurate is your estimate?

How many times would you need to loop to obtain accuracy to within 1 cent? 0.1 cents?

Note: you should avoid storage of large amounts of data. Only store what you need for the computation - you probably don't need any arrays with more than D elements; and not even that if you use looping. But: looping is slow, so it is probably a good idea to use one array of size D in the single run function.