

Scientific Computing (M3SC)

Calum S. Skene

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1 THE BERMUDA OPTION

In its present state the Cox-Ross-Rubinstein algorithm allows you to evaluate American and European style options. A compromise between the two is the Bermuda option. This option, when purchased, allows you to buy or sell an asset for the Strike price at predetermined dates until the expiration date of the contract. Change the Cox-Ross-Rubinstein algorithm within `CRR.py` so that it can also evaluate Bermuda options when **optType = 'Bermuda'**. We will assume that this option can be exercised once each trading month, which we will take to be every 21 days after the day of purchase.

2 APPLE

This exercise can be completed in the file `exer2.py`. Calculate the volatility of an apple share using data from 2014-2015 contained in the `AAPL14-15.csv` file. Using this volatility calculate the American, European and Bermudan call option prices for a contract beginning on **4-JAN-2016** and ending on **31-DEC-2016** (252 trading days) for a strike price of 90 and a current price of 100.06. Given the call option prices would you choose a Bermuda option over an American option? Using the strategy of buying a share at the contract price and immediately selling it at the market price, use the data for 2016 share prices contained in `AAPL16.csv` to determine which contracts are profitable. On which date would you need to exercise an American contract for maximum profit?

3 2008 FINANCIAL CRISIS

This exercise can be completed in the file `exer3.py`. Imagine you have predicted that there will be a financial crisis and shares will be substantially lower at the end of the year, however the American Insurance Group has not predicted the crisis and are therefore happy to sell options based on volatility calculated from the previous two years. What kind of option would you purchase from them on the 2nd January 2008 based on an expiration date at the end of 2008 (31st December)? Work out the price of this option for different Strike prices and see what kind of returns you can obtain using a similar strategy to the previous question. Use the file `AIG06-07.csv` to calculate the volatility and the file `AIG08.csv` to calculate the returns. You may assume a risk-free interest rate of 1%.