Jacobs University
Fall 2019

December 2, 2019

Stochastic Methods + Lab

Take-Home Exam

Due on December 20, 2019

Note: The deadline for uploading this take-home exam on git is December 20 anytime before 23:59. Extensions are only granted if you have been sick (confirmed by a doctor's note) for more than 4 days in between Dec. 2 and Dec. 20. Please also be reminded of Academic Integrity. You are allowed to use your own code from previous homework submissions, but copying code from somebody else is not allowed.

Choose a stock for which you can find recent time series data as well as quotes on European call or put options for different parameters.

(a) Analyze the time series: How good is the assumption of normally and independently distributed log-returns? Estimate the volatility of the stock. Comment on the results.

(b) Determine a suitable risk-free interest rate for pricing the options for which you found quotes.

(c) Price the options with an algorithm of your choice for all maturities and strike prices for which you can find data to compare, and compare with the data. Discuss your result.

(d) List all methods for finding option prices that were discussed in class. In very brief bullet points, list advantages and disadvantages that were discussed in class of the different methods. (This is a theoretical exercise and should be written as comment in the source code.)

Your submission should contain a discussion of the choices you made and of the results. Submit the Python code as a single runnable .py file along with all input data files in csv format.