MA573 - Project

The output should be a complete report, addressing the following tasks step by step.

- Design price engine for

    - American call and put options

    - one of your favorite exotic options, for instance, discretely monitored barrier options, asian options,

    underlying CEV model

    $$dS_t = rS_t \, dt + \sigma S_t^\beta S_t \, dW_t$$

    for a Brownian motion W_t, $\sigma > 0$ and $\beta \in [-1, 0]$.

- Calibrate CEV model to the market data of American call/put option prices underlying some of your carefully chosen stocks.

- To get a sense of validity of the result, calculate some exotic option prices using your calibrated model, and compare the results with its corresponding market price.

Some suggestions are given this below:

- This project should be done in groups of 2 (exceptionally 3) people and shall be uploaded to your github.

- You can (and should) of course consult the (on- and off-line) literature and cite it correctly.

- The data source of all your market data shall be explicitly specified, for example, Bloomberg, quandl, etc..

- This should be a professional report, so the writing (English) should be up to professional standards. WPI's writing center (https://www.wpi.edu/student-experience/resources/writing-center) is a great resource to help you with this, you might reserve time in advance.

- Methodologies on price engines are free to choose, but you may want to convince me why it is correct, efficient, or convenient, etc. This includes derivation, pseudo-code, convergence, convergence rate, etc. In case the mathematical rigorous proof is not available, one shall demonstrate your point with some numerical experiments.

- You are encouraged to recover or outperform (bonus points) some numerical results from the existing literature;

- You are encouraged to design your price engine using different methods, and compare their advantage/disadvantages; For instance, one can

    - One can design American option pricing using both Monte Carlo method and various schemes of finite difference method.

    - One can design Asian option using both crude Monte Carlo method and control variates methods;

    - One can design barrier option pricing using both Monte Carlo method and importance sampling.