Project / HW 10

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**Overview**

T his project required me to implement a number of different solvers to price European and American options. Particularly difficult were the finite difference method solvers, however, once I got one of them working, they all came together quickly. The following techniques were used:

*Methods:*

* Finite difference methods (Explicit, Implicit, Crank Nicholson)
* Monte Carlo simulation (Regression methods and expectation estimation)
* Closed form solutions

*Solvers:*

* Thomas / Brennan for European / American direct solvers
* SOR / PSOR for European / American iterative solvers

**Thoughts**

I think that this was a valuable project for a number of reasons. It really enforced how to design smaller programs in a more generic way that makes them easy to bring together in the end. For example, the Thomas and SOR algorithms from previous HWs required very little modification to get them to work here. Brennan and PSOR solvers were simple extensions of these. I also appreciate that this is something that I might use later on as an employee of a company. Implementing these various numerical methods are valuable skills, and I am grateful to have become exposed to so many different types of solvers and methods.

Overall, I think that having multiple ways to solve the same problem is really good for checking myself, because now I can see when multiple methods agree, or when they don’t agree. This also allows me to explore the weaknesses of some methods.

**Results**

As expected, Crank Nicholson methods provide some of the best estimates of European prices, and they likely perform best with American as well. With more simulations, Monte Carlo would likely perform well too, but for these lower dimensional problems it is very clear that FDM’s work best.

