

FRE 6951

Problem Set 3

Due: Monday, May 13, 2019

- 1) Implement a finite difference solution of the Black-Scholes model to price American calls and puts on a GPU. Develop a function that runs on the CPU and then move the code to a device function to run on a GPU. The input parameters are the interest rate, the volatility, the time to expiration, and the strike for each call and put.
- 2) Implement a finite difference solution of the lognormal stochastic volatility model to price American calls and puts on a GPU. Again, I recommend that you first write a program that you can run and debug on a CPU, and then move the code to a device function for running on a GPU.

The Lognormal SV Model:

$$d \log P = \left(r - \frac{1}{2} v^2 \right) dt + \sqrt{v} dz_1$$

$$v(t) = \exp(y(t))$$

$$dy = \kappa(\theta - y)dt + \sigma dz_2$$

with $(dz_1 dz_2) = \rho dt$, where $\rho < 0$.

- 3) Optional: if you are able to run python with pycuda, take the code (GPU device function) for your solution to problem #3 in problem set #2 (price barrier option with Black-Scholes) and run the model from python.