

Homework #7

Continue with the finite difference PDE solvers –

All options satisfy the Black-Scholes equation. What differs among these options are the boundary conditions. Different options come with different sets of boundary conditions.

Using your favorite PDE solver, fully implicit or Crank-Nicolson method, [price and calculate \(a\) Delta, \(b\) Gamma, and \(c\) Theta](#) for the following options.

1. Bermuda Call and Put options of the following parameters:

$$(S_0, K, \sigma, r, d) = (100, 100, 40\%, 2.5\%, 1.75\%)$$

Options are exercisable monthly with the final Maturity = 1 year (you want to have these exercise times coincide with time grid points, why?)

2. Knock-out European Barrier Options, H is the level of the barrier (You want to set up your grids so the barrier(s) coincide with a grid point(s). Why?).
 - a. Up-and-out call: $(S_0, K, H, T, \sigma, r, d) = (100, 110, 120, 1.0, 50\%, 2.5\%, 1.75\%)$
 - b. Up-and-out put: $(S_0, K, H, T, \sigma, r, d) = (100, 90, 120, 1.0, 50\%, 2.5\%, 1.75\%)$
 - c. Double knock-out put:
 $(S_0, K, H_{up}, H_{down}, T, \sigma, r, d) = (100, 90, 120, 80, 1.0, 50\%, 2.5\%, 1.75\%)$
[Plot](#) Gamma vs. stock price on the evaluation date for this double knock-out put.