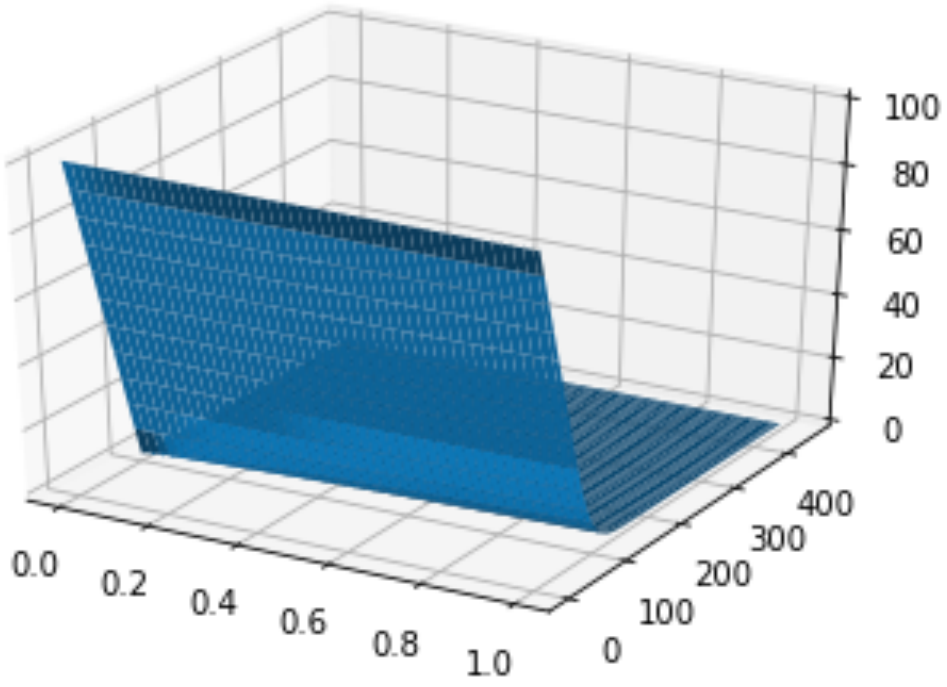
Assignment 7

The implicit scheme was implemented for the American put option using the forward moving method.

American put plot:

The plot for the American put is as below

Smax = 450
T = 1 year
M = 6000
N = 1000
dx = 0.0075
dt = 0.001

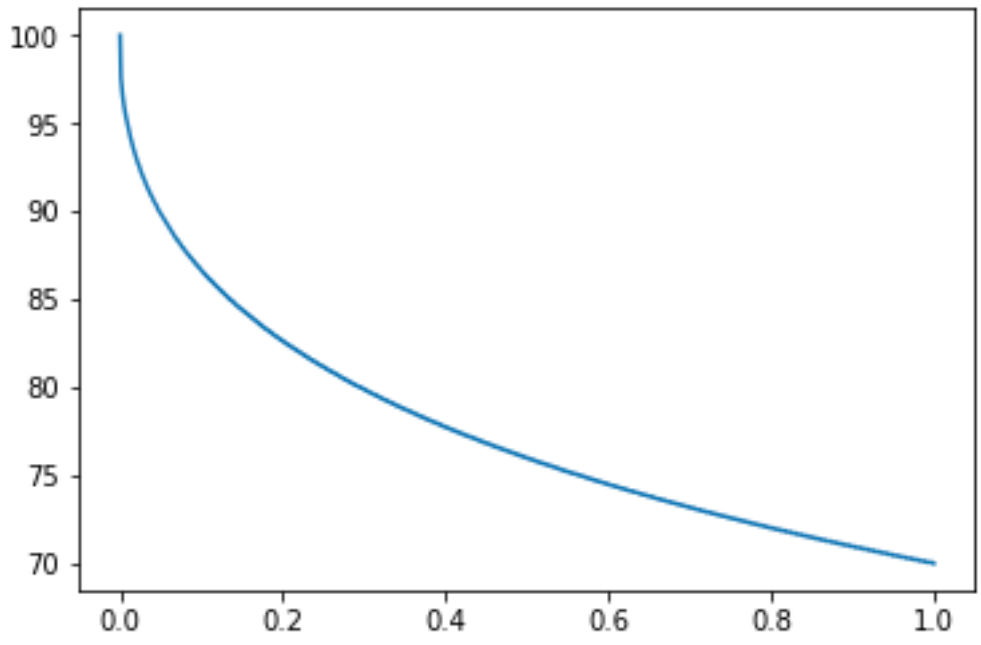


Along the x axis we have the time, y axis the stock price and the option price along the z axis.

Free Boundary:

The plot for the free boundary is as below:

Smax = 450
T = 1 year
M = 6000
N = 1000
dx = 0.0075
dt = 0.001

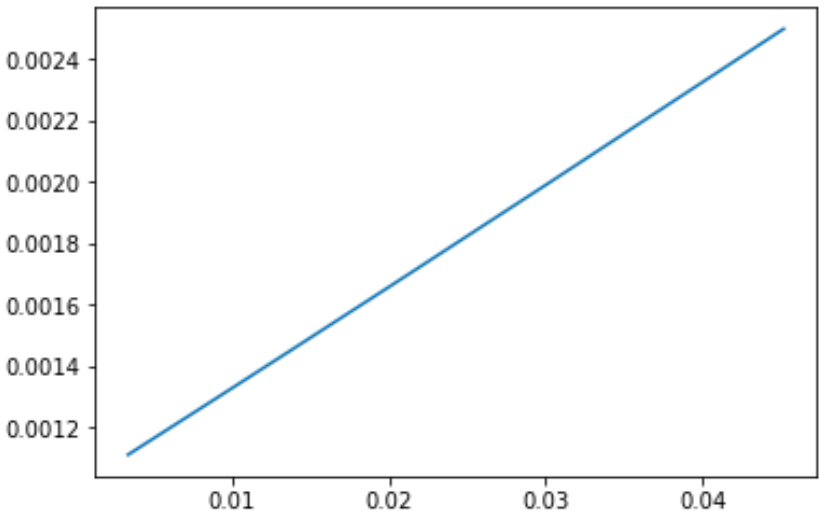


Below the boundary is the exercise region and above the boundary we have the holding region. Time varies along the x axis and stock price varies along the y axis.

Test for convergence:

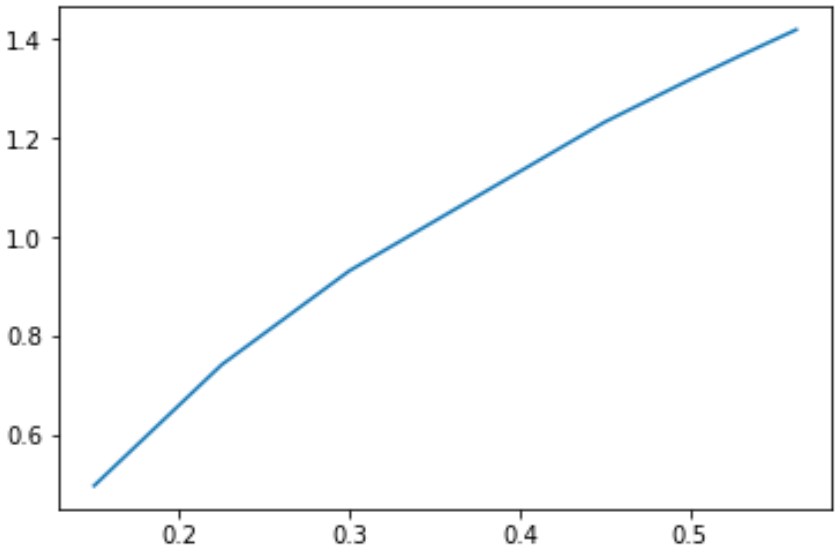
By keeping the dx constant, dt was varied and the error was computed by comparing with the reference value for dx = 0.0075 and dt = 0.001. The error was plotted and it was seen that error is linear in nature as expected.

dt convergence:



By keeping the dt constant, dx was varied and the error was computed by comparing with the reference value for dx = 0.0075 and dt = 0.001. The error was plotted and it was seen that error is quadratic in nature as expected.

dx convergence:



Conclusion:

It was observed that as we refine the mesh grid more accurate results are obtained. Also, there's some instability for certain values for dx and dt which can be eliminated using some other finite difference method such as the Crank Nicholson Method.