Author:

Luo Jiarong, A0198018X

Functions (Q2.5):

makeSmile.m, getSmileVol.m, testMakeSmile.m, testGetSmileVol.m, testPlotVolcurveK2D.m

Works and difficulties:

In this project, I was supposed to construct an interpolation scheme based on a natural cubic spline. Firstly, I considered Matlab function 'spline', but I found that it cannot solve the natural boundary condition. Therefore, I reviewed lectures notes and codes and wrote a spline function like 'ColoredSpline.m'. However, the speed of calculation was slow. Once again, I researched related knowledge on the internet and finally utilized Matlab function 'csape'.

With Matlab function 'csape' and 'ppval', my interpolation scheme worked faster than before. Besides, with mathematic analysis, I calculated extrapolation coefficients aL, aR, bL, bR successfully.

After that, I wrote some test cases in testMakeSmile.m and testGetSmileVol.m to check whether there is an invalid input and make sure that there is no arbitrage constraint. Additionally, I plotted the volatility smile in testPlotVolcurveK2D.m and the graph looked qualitatively smooth. The 1st derivatives were continuous at K1 and KN and the 2nd derivatives were zero at K1 and KN, which meant that our interpolation scheme met original requirement.

I also found that Matlab is amazing in its matrix operations. I made use of this characteristic and rewrote my codes, which speed up my calculation.

In summary, it was a great opportunity for me to know Matlab. On the one hand, I understood applicability and limitation of some numerical methods during my own work. On the other hand, it was a teamwork and actually there were some bugs when I called other team members functions, and thus I was forced to understood the whole project, explored other functions and kept in close communication with my teammates, which increased my team-working skills in program development.