Fin 552 Group Project Assignment

March 2024

1 Introduction and Deadlines

We are kicking off your group project by asking you to start programming in Matlab the following functions. For grading convenience, you are required to define the function with the following names. Those functions are necessary, but may not be sufficient, to successfully complete the whole project. This is a group assignment – as opposed to individual homework assignments – the group project is intended to be a COLLABORATION exercise. The Final Group Project DUE DATE is 04/22 at midnight. Table 1 specifies the project functions and due dates.

	Function Name	Description	Due Date
Function 1.1	Black_Cap_Pricing.m	Convert Bloomberg Market Implied Vol into Dollar Price - Formula 1.26	4/01
Function 1.2	HW_Caplets.m	HW model, Caplets price, based on ZB put Pricing - Formula 2.27	4/01
Function 1.3	Price_to_Vol.m	Converted the optimized HW Cap prices into Black Implied Vols	4/01
Function 2.1	HW_Cap.m	HW model, Cap price, based on Caplets price - Formula 3.42	4/08
Function 2.2	HW_ZBPrice_CF.m	HW model, Analytical Solution for Zero Coupon Bond - Formula 3.39	4/08
Function 2.3	HW_ZBPrice_SM.m	HW model, Monte Carlo Simulation for Zero Coupon Bond - Formula 3.2	4/08
Function 2.4	HW_ZBPut_CF.m	HW model, Analytical Solution fro Zero Coupon Bond Put - Formula 3.41	4/08
Function 2.5	HW_ZBPUL_SM_Q.m	HW model, Monte Carlo Simulation for Zero Coupon Bond Put under Q-Measure - Formula 2.23	4/08
Function 2.6	HW_ZBPut_SM_T.m	HW model, Monte Carlo Simulation for Zero Coupon Bond Put under T-Measure - Formula 2.25	4/08
Function 3.1	HW_Cap_Optimizer.m	Target function of Fmincon. Calculates the sum of error between HW Cap and Market dollar price.	4/15
Function 3.2	Main.m	Function for Optimization	4/15

Table 1: Due Dates and Functions

2 About the Project

Your objective will be to calibrate a Hull-White model to ATM caplet market implied volatilities. You will be expected to go through the following steps: download ATM cap data, program in Matlab a theoretical closed-form pricing function for the Hull-White model, program a Monte-Carlo simulation-based function and verify that it produces the same price of all caps as the closed-form solution, and calibrate the Hull-White model to the data by minimizing the sum of squared pricing errors over model parameters. Your final project deliverables should include clean, bug-free, and well-commented Matlab source code accompanied by "Executive Summary" of results with tables, graphs comparing model vs. market implied vols, as well as intelligent comments on model limitations.

Performing well on the group project requires you to write an "Executive Summary" that discusses your modeling techniques and results. Ideally, you should be turning in a professional, well written report that details the motivation for the project, how you implemented the project, and how your results match up to the observed market quantities. While there are no strict requirements for what your executive report should contain, it is suggested that at a minimum the report should contain a well-thought discussion of how you implemented the project, the model limitations, and how well your model fits the data. The remaining choice of content is completely up to you and your group to

decide. Please note that this open structure of what you submit for the project enables you to exercise a high degree of flexibility in implementing your results. Thus, creativity is an integral part of the group. Making modeling assumptions is completely valid, and all you need to do is clearly state any assumptions you make and why they are justifiable.

Please keep the executive report to 15 pages or less and only include discussions and graphs. Points will be deducted for including code in the executive report.

3 Submission Details

The final submission for the group project should be as follows:

1. A ZIP file containing all your Matlab files.
2. A Word or PDF file with your executive report (15 pages or less). Do NOT include code in the executive report.
3. A TEXT file containing all of your Matlab modules copy and pasted into the file on top of each other.

Note the following:

1. All references pertain to the second edition of Brigo and Mercurio's textbook, which is available for download on Canvas.
2. Please, contact your TA with any questions regarding this assignment
3. Only electronic version will be accepted. Please send all your files in one package and upload to Canvas.
4. Global Variable: You may need to define the discount rate vector as Global Variable in both main function and sub function. For a detail description on Global Variable, please read:

   http://www.mathworks.com/help/techdoc/ref/global.html