

A project on European compound options

A compound option is an option on a option. For example, given $K_{\text{call}}, K_{\text{put}} > 0$ and $T_{\text{call}} > T_{\text{put}} > 0$, let \mathcal{U} be the call option on a stock with strike K_{call} and maturity T_{call} . The put on \mathcal{U} with maturity T_{put} and strike K_{put} gives the right to sell the call \mathcal{U} for the price K_{put} at time T_{put} . All options in this project are assumed to be European.

The main goal of this project is to perform a parameter sensitivity analysis of the put on the call using the binomial model and Matlab. In particular:

- Study numerically how the value at time $t = 0$ of the put on the call depends on $K_{\text{put}}, K_{\text{call}}$ and $T_{\text{put}}, T_{\text{call}}$.
- Study numerically how the value at time $t = 0$ of the put on the call depends on the risk-free rate, the value of the stock at time $t = 0$ and the volatility of the stock.
- Give an intuitive explanation for the parameter sensitivity behavior found numerically.

The results of the project have to be outlined in a report consisting of four sections:

- The first section is the Introduction (1-2 pages). Here is where you state the problem, describe the theoretical framework and discuss the financial applications. You can find plenty of information online, but *remember to cite your sources!*
- The second section is where you report and discuss your results (3-4 pages).
- The third section is the Conclusion. Summarize your most interesting results in this section and comment on possible flaws in your analysis (1 page).
- An appendix where you attach and explain the Matlab codes. The explanation of the codes could appear as comments within the codes themselves.

Remarks:

- The projects can be worked out in groups of max 4 students
- The report has to be submitted in PDF form by e-mail to calogero@chalmers.se. Use OPTIONS 2021 as subject and include all members of the group as recipients.

- Together with the report you have to submit a statement, signed by all members of the group, certifying that this report is your own work and that all members of the group have equally contributed to the assignment. All reports will be subjected to a plagiarism check. Information on how to avoid plagiarism and on Chalmers policy on plagiarism can be found on this link:

<https://student.portal.chalmers.se/en/chalmersstudies/policy-documents/Pages/Academic-integrity-honesty.aspx>

- The deadline for submission is **January 3rd, 2021 at 23.59**. The grade on the project (max 2 points) will be communicated on January 7th.
- The grade of the project is mostly based on the “aesthetical” quality of the report, e.g., on having nice and informative plots (remember to specify labels for the axes). An incorrect interpretation of the results will not affect the grade, so be bold in your arguments!