

Seminar on Case Studies in Operations Research (Mat- 2.4177)

CLIENT: NORDEA

RISK ANALYSIS OF A DERIVATIVES PORTFOLIO

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The logo features the word 'Nordea' in a white, sans-serif font. To the right of the text is a white icon of a sailboat, stylized with a single sail and a hull.

1. Project status

The project is progressing well in the schedule. The project team has not encountered too big problems, and only minor changes to the project plan have been made.

The main goal of producing an easy to use Excel-tool for the four chosen classes of derivatives has not changed significantly. At this stage, we have created some models and started validating them. The models for interest rate swap, cross currency swap and the two foreign currency based (FX swap & FX forward) contracts have shown positive preliminary results, and their validation is progressing currently. While the accuracy with FX contracts seems to be outstanding, the probability of inaccuracy in our interest rate based models has risen, as the numbers given by the model have been slightly different from the ones calculated by more sophisticated models used by the client. This can however be explained by the fact that we have used linear interpolation to estimate the yield curves [1]. Method to combine results on portfolio level is still under construction.

The second project part, the examination of the portfolio exposure simulation has been started by reviewing literature. We have designed a high level structure for the simulation, but the details of the implementation still have to be clarified.

2. Updates to schedule and tasks

Project planning, preparation with the client and model architecture planning tasks are now completed. Even though background learning part was done a while ago, we had to revise and look more closely into the material as we made progress. However, we learned the basics quite well during the task.

Calculating the values of the interest rate derivatives was more difficult than we initially estimated. Therefore the constructing of the model took longer, but it seems that we will not have problems in getting the project ready before the due date in May.

New data has been received a few times from the client, as our data needs have become more specific. Currently, the Excel-file containing the model is tens of megabytes in size. It was impossible to get interest rate curve data from the client, and therefore we unexpectedly had to find a way to estimate the interest rates to all the future dates (for ten years from today) in many foreign currencies. This was done in a simple way that is still acceptable in terms of estimating accuracy.

3. Risks

A few changes in the outlook for risks are considered and comments regarding these risks are provided as follows. Updated probabilities for the recognized risk scenarios are found in Table 1.

Workload or difficulty exceeds resources

The workload has been a bit greater than expected, since a lot of time has been spent on studying how the pricing models are built by the client. Particularly, difficulties were faced due to lack of the accurate interest rate predictions that the client uses in their pricing models. However, the resources have not been exceeded so the risk event has not come true. Moreover, no more issues regarding this risk are expected anymore and the probability of the event remains at the original level remote.

Poor data quality

This risk was realized, as several critical pieces of information were missing from the initial data set given by the client. Therefore, we had to ask for improved data sets a couple of times. This risk was anyway considered as likely to happen. Now, however, the data should meet the requirements of our model, and future issues regarding this risk are considered unlikely.

Poor accuracy of the model

This risk has turned out to be likely because we do not have access to the exact pricing models that the client uses. Within the limits of this project, we have to settle for using the literature based pricing models, so the accuracy does not meet perfectly the market values. Especially, explaining the interest rate derivatives is inaccurate because of lack of the correct yield curve models.

Table 1. Project risk assessment

| Risk | Probability (In project plan) | Effects | Preventive actions | Mitigating actions |
|--|--|--|---|---|
| Team member absence or inactivity | Unlikely (Unlikely) | Project is delayed, workload grows for other members | Agreed commitment to the project, personal health care | Redistribute workload, adjust schedule |
| Workload or difficulty exceeds resources | Remote (Remote) | Project does not meet the objectives | Workload distributed evenly, well defined project scope | Negotiate project scope with client |
| Poor data quality | Unlikely (Likely) | Increased workload | Careful inspection of the data | Filter corrupted data, ask for new data |
| Poor accuracy of the model | Likely (Unlikely) | Failure to deliver accurate tool | Acquire deep understanding of the underlying theory | Try to improve tool |
| Excel turns out to be insufficient software | Unlikely (Unlikely) | Failure to deliver useful tool | Well defined requirements for the Excel tool, proper validation | Inform client about tool limitations |

References

[1] International Swaps and Derivatives Association, Inc.

Documentation: Linear interpolation, 2006

http://www.isda.org/c_and_a/pdf/Linear-interpolation7-10-06.pdf