MS-E2177 - Seminar on Case Studies in Operations Research (V)

Attributing changes in CVA risk capital charge for OTC derivatives portfolio

Interim report

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Glossary

CVA Credit Valuation Adjustment is a number that describes what is the value of the risk of a counterparty defaulting. 2

CVA risk CVA risk measures the amount of capital a party has to have set aside due to regulation and preparation in case a counterparty defaults. 2

derivative A finance product that derives its price from some other product or rate. 2

OTC Over-The-Counter derivatives are not publicly traded, instead two parties do the deal between themselves. 2

1 Changes in the objectives and scope

The large change in the team size forced the team to adjust the scope of the project for a more reasonable size. This meant adopting an arguably little less sophisticated approach to the problem. The objectives have, however, remained the same. This project is about identifying the impact of constantly changing market variables on the CVA risk for OTC derivatives. The first model has been done to calculate how CVA risk changes with the changes of some individual drivers, such as, interest rates and cross currency exchange rates.

Once satisfied with the first model, the scope can be increased to try and apply Adjoint Algorithmic Differentiation (AAD) as a method to solve the impacts. There exists some guides unique to applying AAD to CVA calculations [1], [2]. Whether to dive in to this new theory will be decided based on the performance of the first model and the remaining time left in the project.

2 Project status

For most parts it is safe to say that with the decreased scope the project is on schedule. Gathering data has been mostly completed, but new needs may arise with further building of the tool. Same goes for reviewing literature, as it is done for the current version of the model, but investigating AAD requires further scrutiny of related literature. Due to some absence from both team members, the activity section B was not carried out in keeping with the planned schedule but instead was heavily focused on the second half of the stint.

Despite this, the first model was built and has already been applied to a test portfolio with promising results. After the project plan presentations, a new data set was claimed from the client where the portfolio values had been calculated again with artificial changes of single parameters. Calculating the CVA risk for these new portfolios enables the team to compare the effect of single parameters to CVA risk and through this approximate the real life data changes. As mentioned above, the first results are promising and deviate reasonably little from actual results. The difference can originate e.g. from combined effects of parameters that are not noted at this point. For example, especially with exchange rates, it is not clear how well different currencies correlate with each other. Many currencies behave similarly and their total effect can be less than the sum of them.

The tool is still under construction on the user experience side, lacking visual repre-

sentation of the results, adaptability to possibly different forms of input data, and the ability to inform the user of possible errors. For the remainder of the project, Figure 1 shows the updated project plan.
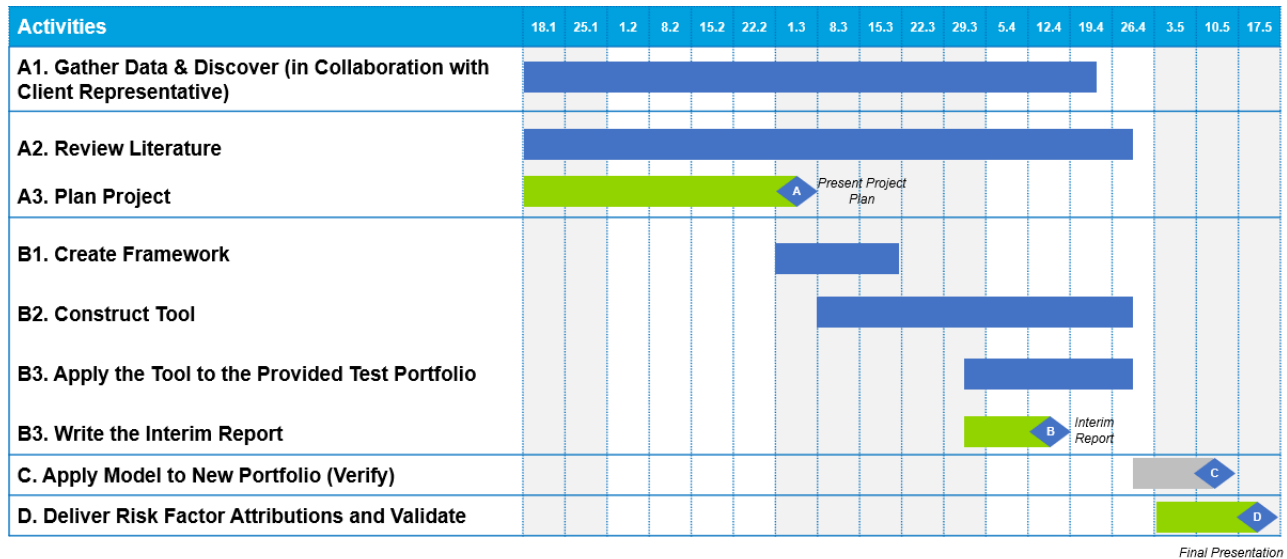

Activities	18.1	25.1	1.2	8.2	15.2	22.2	1.3	8.3	15.3	22.3	29.3	5.4	12.4	19.4	26.4	3.5	10.5	17.5
A1. Gather Data & Discover (in Collaboration with Client Representative)																		
A2. Review Literature																		
A3. Plan Project								Present Project Plan									
B1. Create Framework																		
B2. Construct Tool																		
B3. Apply the Tool to the Provided Test Portfolio																		
B3. Write the Interim Report														Interim Report			
C. Apply Model to New Portfolio (Verify)																		
D. Deliver Risk Factor Attributions and Validate																	Final Presentation	

Figure 1: The updated schedule.

3 Changes to initial project plan

At the moment the team has not seen any major changes regarding the initial project plan presented earlier. Depending on what the first model yields the team focuses on either building another model with hopes for better quality output, or polishes the current model into a diamond. The former would basically start over the process from the project plan until this moment with the updated model. With the expedition of the gained experience from the first model and more available time for both team members, this is estimated to still be possible.

4 Updated risk management plan

Figure 2 shows the updated risk table. At this point of the project the team has already gathered most of the required data and the documentation provided by the client has been availale. Thus, the risk level has been lowered to unlikely. Similarly, team member absence has been lowered to unlikely level, since the project has progressed and both team members have showed commitment towards finalizing the project with the best outcome for the client. Additionally the ending of most other classes will free more

time for the project. Despite being more unlikely, the absence would have more severe impacts at this point. It would be highly probable that the project discontinues and client will not receive the final results of the project.

Risk to project success	Probability	Effects	Preventive actions	Mitigating actions
Client data incomplete **Client documentation inaccessible due to restrictions**	Green (Unlikely)	• Results may not tie as expected • Replicating Client calculation of CVA may be limited by inaccessible documentation • Increased workload	• Adjust client expectations on verification and validation methods • Discuss and agree with the client on the methods and formulas used	• Use simulated data and make justified assumptions Establish alternate means of validation • Provide documentation on how client can alter or extend model in-house
Differences in properties or calculations of key measures	Red (Very Likely)	• Results may not tie exactly as expected • Client might have to adjust the calculations to fit their methods	• Adjust client expectations on verification and validation methods	• Pick one measure and follow through with analysis even if it does not tie • Document the used methods and formulas
The resulting tool does not provide accurate enough results	Yellow (Likely)	• The tool will provide low or no value to client	• Adjust and discuss client expectations on expected performance	• Explain the achieved performance level to the client, strive for performance
Disclosing confidential information	Green (Unlikely)	• Loss of trust from client, possible sanctions	• Deliver each deliverable to client for checking before publishing	
Team member absence or inactivity	Green (Unlikely)	• Project is not completed • Client will not receive full results	• Agreed commitment to the project • Personal healthcare	• Redistribute workload • Adjust schedule • Down-scope if possible

Figure 2: The updated risk table.

4

References

[1] University of Oxford, *Computing Sensitivities of CVA using Adjoint Algorithmic Differentiation*, 2015, retrieved 8.4.2019 from: `https://www.nag.co.uk/market/articles/computing-sensitivities-of-cva-using-aad.pdf`

[2] Adil Reghai and Othmane Kettani, *CVA-AAD*, 2017, retrieved 8.4.2019 from: `https://www.ceremade.dauphine.fr/~brugiere/files/HoF%202017%20Advanced%20Technics%20in%20Finance/Reghai%20Kettani%20CVA.pdf`