

# **Mat-2.177 Seminar on Case Studies in Operations Research**

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**Electricity Forward Curve Generation**

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# **Project Plan for Project Work Seminar Electricity Forward Curve Generation** 2(4)

## **1 CURRENT SITUATION AND RESULTS**

The project has progressed relatively well following the project schedule. The literature review has been finished and almost completely written in the final report and the construction of the algorithm is ready on a schematical level although the Excel implementation is still under development as opposed to the initial project plan. The project buffers will be adequate to compensate this small delay especially as a significant portion of the final report has already been drafted.

We have investigated different approaches found in the literature for constructing forward curves. There is abundant research on interest-rate market spot and forward processes but for markets that are characterized by seasonality the literature is much more scarce. No directly applicable methods have been found for our case. However, we have found approaches and ideas that we have been able to use to build our approach to the project problem. The solution that we have conceived is not a direct application of a method found in the literature. We have found that the most challenging problem is the seasonality structure of the spot price. Thus, we have concentrated especially on this problem and decided to use straight-forward methods such as simple interpolation and extrapolation to account for over-lapping data or missing data periods.

We have also made a limited data analysis of Nord Pool data to get a better overview of characteristics of the data.

## **2 CHANGES IN OBJECTIVES AND SCOPE**

The main change in the objective is, that we concentrate on the modelling of the forward curve given the market data for the calculation date. Thus, we have together with Process Vision limited data manipulation and retrieval in Excel out of the scope of the project and decided to concentrate on modelling the seasonality of the forward curve. In addition, we have decided to possibly use other tools than Excel to make the post-analysis of our algorithm. As an example, we have used Java to make a forward-price process model that we will use for benchmarking purposes.

The post-analysis of the algorithm has been focused to include an analysis of the ex-post forecasting ability of our model in comparison with another spot forecasting process as well as

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comparison of a forward price model calibrated with forward-market based data and another model calibrated with historical data.

### 3 CONTINUATION

The continuation of the project will largely follow the project schedule. Some work is left in finishing the Excel tool that was scheduled before the intermediate report.

The next immediate step will be to secure the needed data for Nordic reservoir levels to use it as an external factor for modelling the historical spot price level.

The project group has gathered almost weekly during the first phase. These weekly gatherings have shown to be very valuable for status update, exchange of new ideas as well as division of tasks as the work progresses. They will be continued until the end of the project.

### 4 RISKS

In general, the risks are significantly reduced at this stage of the project. We believe, there should not be any major obstacles anymore to prevent us from carrying the project to its objectives. However, our approach would benefit from external data explaining the historical and future levels of forward prices. We have decided to use the deviation of reservoir levels in the Nordic markets as such factor. The data acquisition is still on-going and may pose some problems, in which case we will have to use the model without any external factors. This does not prevent us from achieving the objectives but may affect the level of proof we can show about the goodness of our results.

The following Table 1 shows the initial and current risks as well as their initial and current likelihood.

**Table 1. Project risks**

Risk	Impact	Initial Likelihood	Current likelihood	Preventive actions
No well-founded method to build FW algorithm is found in literature	Medium	Low	Very low	Significant effort put in literature survey. Project group holds dedicated work-shop sessions to go through literature findings and own inventions and adapt them to this relevant problem

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Project results do not match the project objectives	High	Low	Very low	Project manager can make re-orientation of the research directions in the first phase if needed.
The project time resources are not adequate to finish the project in time	Medium	Low	Low	The project time table is strictly followed during the project. Scope will be adapted if significant discrepancy between available time and project scope arise.
Project group aptitudes do not match the requirements of the project, especially VBA programming	Medium	Medium	Low	The project group makes some preliminary work on the design of the Excel worksheet and algorithms to have sufficient time to learn the programming needs of the problem. As a last resort, the option to change to another tool than Excel is kept open.
The problem is not feasibly solved using Excel	High	Low	Very Low	The project group gathers similar analyses results done in Excel. Optimisation problem scope is reduced if Excel solver efficiency or capability is not sufficient. As a last resort, the option to change to another tool than Excel is kept open.
Needed is data is not available	Medium	-	Medium	The project groups concentrates currently on finding the needed data at least for some time period.

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