Elprice
Electricity price sensitivity

Innovation area: Finance/Commodity

Key Innovator: Kjersti Aas

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Scope:

Contribute to the next generation tools for the management of electricity price risk and production planning.

Results in 2012 and plans:

1. Forecasting CfD prices using prior elicitation

Contracts for Difference (CfDs) are forwards on the spread between area and system prices. Together with system price forwards, these products are used to hedge the area price risk in the Nordic electricity market. CfDs are typically available for the next two months, the next three quarters and the next three years. However, CfD contracts are not traded at NASDAQ OMX Commodities for every Nord Pool Spot price area. We therefore ask the following hypothetical question: What would the CfD price have been, say in the price area NO2, if it had been traded? We build regression models for each observable price area, and use prior information on how similar the different price areas are to forecast the price in an area where CfDs are not traded. The problem is extra challenging for two reasons: 1) The CfDs that are actually traded are not as liquid as desired. 2) The price area definitions in Norway seem to be constantly changing, giving us short time series to work with. Validation is therefore difficult.

As system forwards are used to assess long term market expectations, system forwards + CfDs can be used to form expectations in each price area, and is therefore applicable in long term models. An alternative approach would be to estimate the price area specific risk premium. If the (unobservable) risk premium was zero and the market was liquid enough, the two approaches would yield the same answer. To the degree that the limited data allows, we will assess the model's performance by investigating how the CfD model compares with estimated price area specific risk premiums. It might be that with the limited data, the CfD model approach with some risk premium adjustments is the only viable path to success (both in terms of publications and innovation).

2. Forecasting solar electricity production

On the 29th of May 2012, solar power covered half the German power consumption. This has a large impact on electricity prices, and together with wind power it will play an increasing role in the German electricity market and therefore also the Nordic market. Quite a lot of work has been done on forecasting wind power, especially for single wind farms, while less attention has been paid to (aggregate) solar power production. Such forecasts should rely on sun coverage (or similar) forecasts, but must be converted into production. This is not trivial, since 1) the installed solar capacity increases every month and 2) there is not a one-to-one correspondence between the optimal and the actual production, for example since snow may cover the solar panels during the winter. Our aim is therefore to build state of the art forecast models for solar power or the combined production from the two major German renewables solar and wind, taking the intricate correlation structure into account. The academic potential is very good, since relatively few have worked (openly) in this field. The innovation potential is also excellent. Solar power productions are valuable in themselves, while the ultimate aim is to use them to improve spot price predictions, both in the German and Nordic markets.

3. Forecasting supply and demand curves

The standard approach when forecasting future electricity spot prices is to either build a model from historical prices or to first forecast the demand and, conditional on this, forecast the price. Covariates like temperature may be included. This standard procedure focuses solely on the demand side, and partly ignores the manner in which spot prices are settled. In the Nordic region, the system spot price for each hour is determined by the intersection of the aggregate supply and demand curves which represent all bids and offers. Such historical supply and demand curves are now available. Our aim is therefore to forecast the supply and demand curves for the next days, based on historical curves. Again, covariates like temperature may be included. The supply and demand curves are monotone functions of price and produced volume, and their shape can vary throughout the year. Both forecasting the curves and their intersection are of great interest. There is also reason to believe that the resulting price uncertainty and sensitivity analysis is better represented than with the standard approach. A successful forecast model for solar electricity production (task 2 above) can be integrated and improve the supply curve forecasts. A successful model can be implemented and replace the current approach for forecasting demand and prices, or work side by side with the current approach. Every substantial improvement in forecast models will contribute to better profit margins for the producers or buyers; hence the innovation potential is high.

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