Short-term Hedging for an Electricity Retailer

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Executive Summary

The recent liberalization of electricity markets has raised new risks for some of the markets' participants. For example, retailers often face the situation of buying electricity at a variable price from wholesalers and selling at a fixed price to end-users. The highly volatile nature of electricity prices due to its non-storability and the uncertainty surrounding the quantity of electricity to be provided create respectively price and load risk, putting the retailers' profits at risk. It is therefore crucial for retailers to develop efficient hedging schemes to mitigate these risks.

The current paper develops statistical models representing the dynamics of the electricity load (quantity of consumed electricity) and electricity futures price on the Nord Pool Scandinavian market. These models serve as inputs to a global hedging algorithm that is developed for a retailer to hedge its exposure to price and load risks while accounting for the basis risk with weekly futures contracts. The algorithm, called semi-quadratic global hedging, uses dynamic programming to minimize the terminal squared hedging shortfall above some defined target in order to limit losses related to electricity procuration cost.

In-sample and out-of-sample hedging backtests show that the semi-quadratic global hedging procedure developed outperforms the benchmarks in reducing the risk borne by the retailers. When the tools developed in the current paper are used, a significant reduction in several risk metrics applied to the weekly hedging error is observed. In the out-of-sample test, using our load-basis model instead of the simple model in the delta hedging procedure reduces the $TVaR_{1\%}$ from 172,900€ to 161,900€ for a retailer serving 1% of the Nord Pool load. When our global hedging procedure is applied, the $TVaR_{1\%}$ is further shrunk by a considerable amount to 128,100€.

Widely publicized failures of retailers in the United States (e.g. Pacific Gas and Electric Company in 2001 and Texas Commercial Energy in 2003) highlight the need for electricity retailers to implement sound risk management procedures. Regulators might also implement policies to assure the good functioning of electricity markets: the California Public Utility Commission requires retailers (called load serving entities in the US) to use forward contracts and options (with mandatory physical settlement) to reduce their risk exposure. The research work in this paper provides retailers with a useful and practical hedging algorithm which can help them tackle the price and load

risk mitigation problem. This should help retailers reach a more profitable and less risky financial profile, and contribute to a better overall functioning of electricity markets.