ELECTRICITY FUTURES MARKETS IN AUSTRALIA – AN ANALYSIS OF RISK PREMIUMS DURING THE DELIVERY PERIOD

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Overview

Parties exposed to the spot electricity market hedge their exposure using a variety of instruments. These include forward contracts for the physical supply of electricity and, increasingly, standardised futures contracts traded on the futures markets that require financial settlement. Research into the value of these hedging instruments compared to the corresponding ex-post value on the electricity spot market has provided mixed results. Defining the premium as the value of the futures instrument less the corresponding value on the spot market, some researchers report a positive premium, see e.g. Longstaff and Wang (2004); Hadsell and Shawky (2006); Diko et al. (2006); Bierbrauer et al. (2007); Daskalakis and Markellos (2009); Redl et al. (2009); Redl and Bunn (2013). On the other hand, Bessembiner and Lemmon(2002) and Botterud et al. (2010) report a negative premium for the US PJM and the Scandinavian Nord Pool market. The positive or negative observed premiums may be highly dependent on the time to delivery of the contract. In Australia, electricity futures contracts continue to be traded on the ASX during the period of delivery. While researchers have investigated the premium before the delivery period, our research fills a major gap in the literature by investigating the behvaviour of the premium during the delivery period.

In this paper we provide an empirical analysis of the changing risk premium of electricity futures contracts and capture the dynamics between the premium and its determinants during the delivery period. In particular we relate the observed risk premiums to variables including open interest, the time to maturity of the contract, historical and recent information on the behaviour of spot electricity prices as well as the historical behaviour of premiums. As a futures contract enters delivery, it continues to be traded until expiry and the observed futures price can be decomposed into three parts: the crystalised value of the portion already delivered, the average spot price for the remaining days of the delivery period, and the risk premium for the remaining days of the delivery period. We examine ex-post or realised futures premiums during the delivery period for quarterly base and peak load pooling the three main regional markets of the Australian National Electricity Market (NEM) – Queensland, New South Wales and Victoria.

Methods

Using data from the NEM and the ASX, we calculate the premium based on a pooled dataset from the three major regional markets in the NEM. We use futures price data from the days on which contracts were actually traded. To take care of seasonality in electicity consumption and volatility, we use quarterly contracts for the base and peak load period ahead.

The multiple regression model we develop incorporates explanatory variables based on accessible data from the spot and futures market to explain the dynamics of the observed premium during the delivery period. The model includes variables relating to the market, open interest; contract characteristics, the remaining number of days until maturity; recent spot price volatility and level, spot price volatility in the previous month and average spot price in the previous week as well as longer term indicators, the average premium of the same quarter in the previous three years. Some of the terms extend the equilibrium model developed by Bessembinder and Lemmon (2002) which includes variance and skewness of the wholesale spot price.

Results

We find significant positive risk premia in Qld, NSW and Vic, indicating that the futures prices paid during the delivery period typically are higher than the eventually observed average spot price during the days of the delivery period. Our findings suggest that the premium is negatively related to open interest, which signifies that the presence of speculators reduces premiums. Premiums are also negatively related to the average premium of the same quarter over the previous three years which indicates a learning from previous market performance. The premium varies positively with the standard deviation of the spot price over the previous month and the spot price level over the previous week. Finally we explain why the premium varies positively with the time remaining to expiry of the contract in quarters one and three, but negatively in quarters two and four by reference to the NEM characteristics.

Our multiple regression model provides a relatively high explanatory power for the observed premiums and has potential to be used as part of a strategy to manage exposure to the electricity market

Conclusions

We find significant positive risk premiums in regional Australian electricity futures markets during the delivery period of the contracts. Our results indicate the willingness of consumers to pay an additional mark-up to hedge against the exposure to volatility in the electricity spot market. The model we propose has high explanatory power for the dynamics of the observed premiums during the trading period and is of interest to market participants such as traders, retailers, producers, consumers and hedgers. It is relevant in particular for risk management and hedging strategies during the delivery of futures contracts using standardised, traded and transparent electricity futures market instruments.

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