LIQUIDITY AND RISK PREMIA IN ELECTRICITY FUTURES

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Overview

In this paper, we look at the liquidity of electricity futures generally and whether liquidity risk is apparent in risk premia in the context of the New Zealand electricity market. The paper makes two broad contributions. First, from an academic perspective, we augment the literature on the determinants of risk premia by incorporating measures of (il)liquidity in our comprehensive models of the determinants of risk premia. Second, this is the first detailed empirical examination of both liquidity and risk premia in the New Zealand electricity futures market. Further, we explore the effectiveness of two 'policy-induced' or 'encouraged' interventions to increase the efficiency and liquidity of the futures markets. These are the introduction in 2010 of 'mandatory' making by the four largest generators and, in 2011, the implementation of a maximum bid-offer spread of 5% in the futures market.

Methods

We address the following two research questions:

- Q1. How has the liquidity of the NZ electricity futures market evolved over time, and have policy-induced interventions to increase liquidity succeeded?;
- Q2. What drives risk premia in the NZ electricity futures markets and is (il)liquidity a factor in these premia?

These questions are addressed by using data for the period 2nd October 2009 to 31st December 2015. We employ from the literature three measures of liquidity or illiquidity on which we run structural break tests (Bai and Perron, 1998). Further, our comprehensive models to explain risk premia include a range of risk factors which we categorise as either statistical, physical market, production cost, investor behaviour or liquidity variables. Further details of our methods are available from Bevin-McCrimmon *et al.* (2016).

Figure 1a. Evolution of Volume

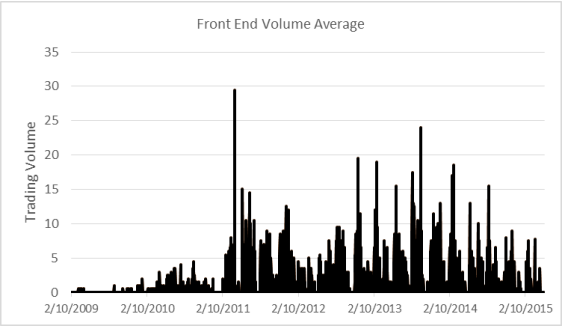
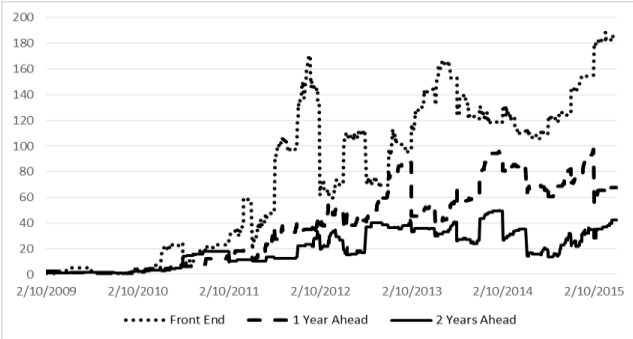


Figure 1b. Evolution of Open Interest



Results & Conclusions

Our empirical results documented increasing (decreasing) liquidity (illiquidity) for contracts of all maturities (front month, one year and two years), a result which is encouraging for a relatively new market (See Figure 1a and 1b). The results of our structural breaks tests demonstrate that the imposition of mandatory market making did not improve liquidity, yet the reduction in the maximum bid-ask spread did, albeit at the front end only. For regulators, this may provide support for a future reduction of the maximum bid-ask spread; however, any potential liquidity increase must be traded off against the potential additional risk and costs imposed on market makers. Should further reductions in the maximum allowable spread be imposed in the future, the returns to this policy may be diminishing.

Table 1. Average Risk Premia 2/10/2009-31/12/2015

Contract Form	Front End		One Year Ahead		Two Years Ahead	
Node	**Benmore**	**Otahuhu**	**Benmore**	**Otahuhu**	**Benmore**	**Otahuhu**
Overall	-0.61	0.10	13.15 ***	6.90 ***	13.18 ***	7.56 ***
Q1	-9.56 ***	-6.63 ***	-16.59 ***	-18.66 ***	-30.43 ***	-23.20 ***
Q2	12.34 ***	12.73 ***	26.46 ***	27.72 ***	25.90 ***	23.71 ***
Q3	1.81 **	2.00 ***	42.04 ***	26.12 ***	54.93 ***	34.64 ***
Q4	-6.29 ***	-6.72 ***	1.39	-6.12 ***	2.54 *	-3.69 ***

*** represents statistical significance at the 1% level, ** represents significance at the 5% level, * represents significance at the 10% level

We also document significant premia, both positive and negative, in all three contract maturities (See Table 1). Premia are consistently higher during the winter quarters, yet significantly negative during the summer quarters. Regression estimations show limited support for the Bessembinder and Lemmon (2002) model and suggest that physical market factors play a role in driving front-end premia (see Bevin-McCrimmon *et al.*,2016 for more details). Most surprising is the significant explanatory power of the current spot price on futures one and two years ahead, leading to our suggestion of inefficient behaviour of market participants. This documented inefficient behaviour may also be attractive for speculative investors who wish to take advantage of such anomalous price movements. However, due to the relative illiquidity of the longer-dated futures, exiting positions and realising any profits may prove difficult.

Finally, we find that liquidity risk does affect risk premia, but generally only in the case of longer-dated futures. Thus, our results show that liquidity is priced into the risk premia for the less liquid futures. From a policy perspective, this suggests that market participants are paying a premium for these contracts, potentially leading to under-hedging of long- to medium-term exposures or market inefficiencies more generally. From an academic perspective, our results show that models of risk premia need to incorporate liquidity as a risk factor.

References

Bai, J. & Perron, P. (1998). Estimating and testing linear models with multiple structural changes. *Econometrica*, 66(1), 47-78.

Bessembinder, H., & Lemmon, M. L. (2002). Equilibrium pricing and optimal hedging in electricity forward markets. *Journal of Finance*, 57(3), 1347.

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