

A multi-layer risk factor approach to Electricity Price and Volume Risk

Ariel Liebman

ARC Centre for Complex Systems , University of Queensland, School of ITEE, St Lucia, 4072, Queensland, Australia

Corresponding author e-mail: *a.liebman@uq.edu.au*

The Electricity Markets around the world, and in particular, in Australia has some extreme price volatility and unique characteristics. Specifically the prices exhibit spikes with varying frequency and size as well as more 'normal' price volatility of a relatively high level. Additionally the price movements are correlated to varying degrees with demand fluctuations. This presents great challenges to the risk management of retail, generation and vertically integrated portfolios.

Traditionally price models attempt to model the movements of price only, without taking into account the interaction between temperature, demand, and price.

Some hybrid models that take these into account have been formulated. We apply and extend some of the principles in such hybrid models and tools including ARIMA and Poisson jump processes. We explicitly model temperature fluctuation, demand fluctuations and the correlation between these factors, and incorporate Poisson based models of the market's supply-curve movements. Additionally we model the residual price noise unaccounted for by these factors, as a separate risk factor.

The multilayer model produces the best fit of price statistics in the electricity market. We also outline how the interaction between these factors can be used to improve models of the leveraged risk in a combined retail and generation portfolio where unexpected changes in supply and demand can affect the regional spot prices.