

The Spikes of The Electricity

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Outline

- Motivation & Introduction to the data
- Time series plot for the data
- Proposed methods
- Reference

Motivation

- In American, wholesaler have to buy electricity in market, but we do not. So it is interesting.

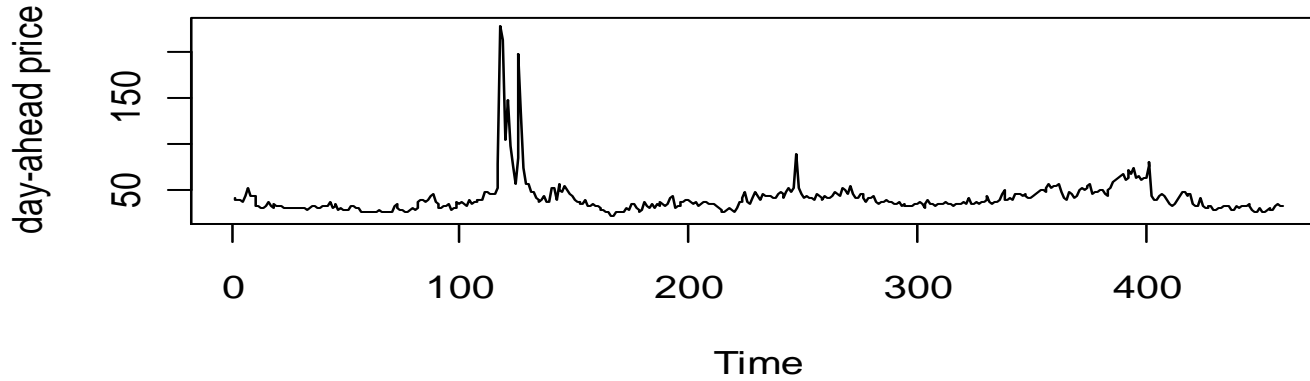
Introduction to the data

- The first data is the delivery date from 2009/01/05 to 2010/11/15 in the Ercotsouth which is a main trade hub in Texas.
- The second data is the delivery date form 2009/01/07 to 2010/11/10 in the PJM West which is a main trade hub in Pennsylvania.
- The prices are computed by Wtd Avg Price \$/MWh, where the Wtd Avg Price is

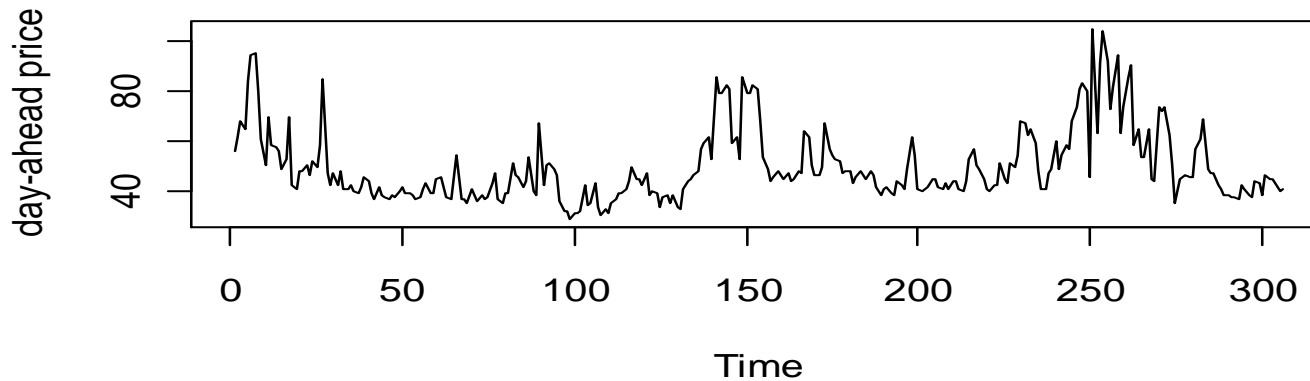
$$I = \Sigma (P \cdot V) / T$$

Time series plot for the data

Ercotsouth



PJM West



Proposed methods

Geman and Roncoroni (2002) introduce a jump-reversion model for electricity spot prices, namely the representation of $S(t)$, by:

$$\begin{cases} E(t) = \ln S(t) \\ dE(t) = f(t) + \theta[\mu(t) - E(t^-)]dt + \sigma dW_t + h(t^-)dJ(t) \end{cases}$$

Where:

$E(t^-)$ stands for the left-hand limit of f at time t .

The deterministic function $f(t)$ accounts for seasonality.

The second term insures that any shift away from the trend generates smooth reversion to the standard level $\mu(t)$ at mean-reversion speed θ .

The discontinuous part reproduces spike occurrence.

$$J(t) = \sum_{i=1}^{N(t)} J_i$$

Where:

$N(t)$ is a Poisson process with *time-varying* intensity.

J_i is iid exponential distribution.

$$h(E(t)) = \begin{cases} +1 & \text{if } E(t) < \tau \\ -1 & \text{if } E(t) \geq \tau \end{cases}$$

where the threshold τ is calibrated to market data.

Reference

- U.S. Energy Information Administration

Independent Statistic and Analysis

<http://www.eia.doe.gov/cneaf/electricity/wholesale/wholesale.html>

- Roncoroni-Geman (2002) ;The Journal of Business

Understanding the Fine Structure of Electricity Prices