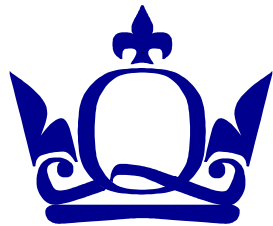




Time series analysis of the Norwegian electricity spot prices



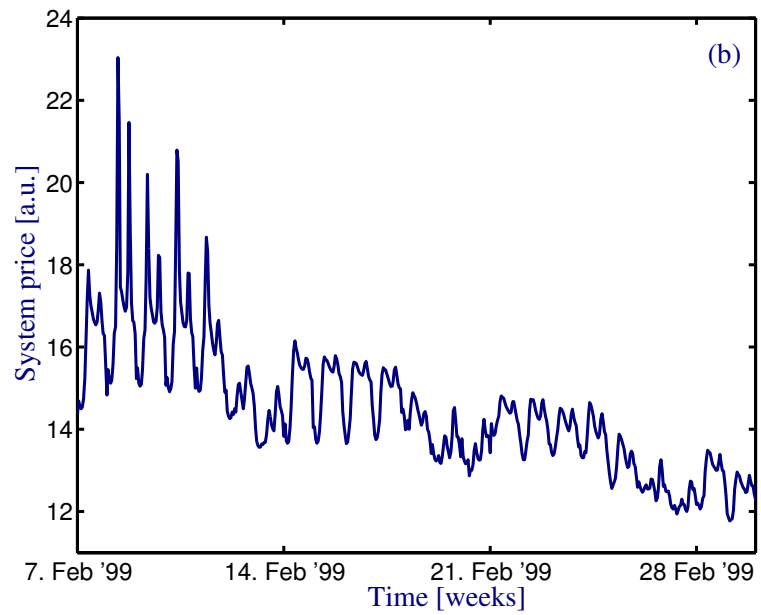
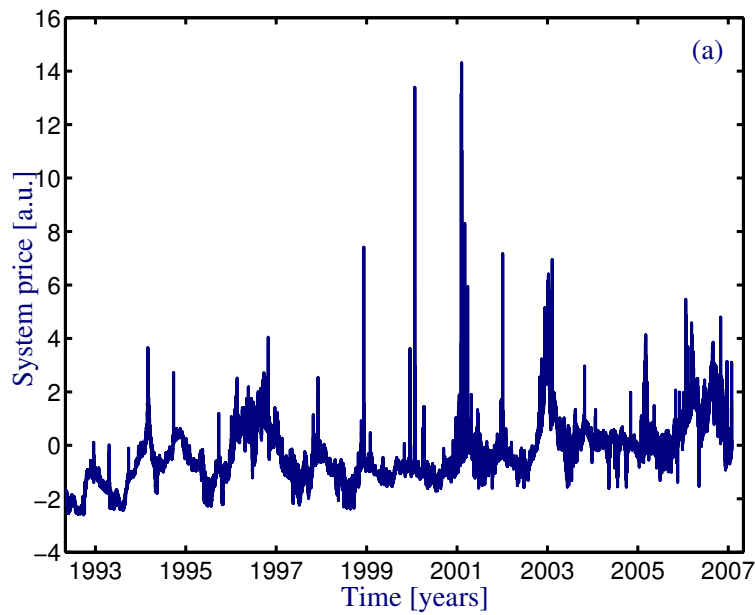
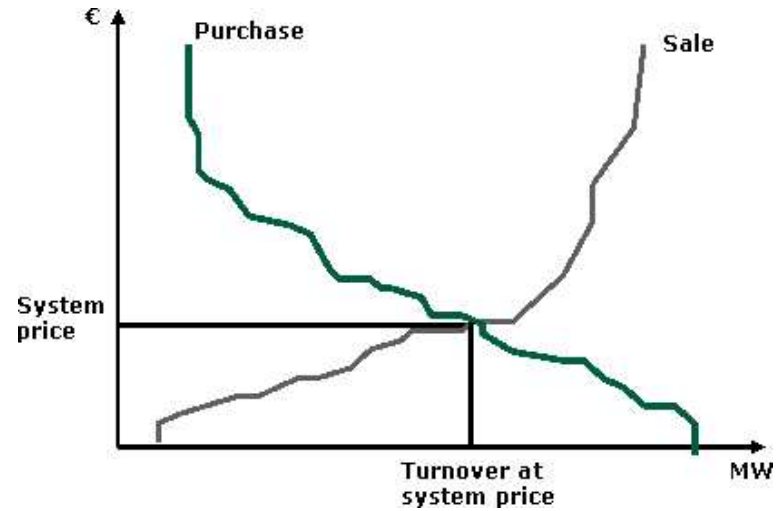
Hartmut Erzgräber
Hugo Touchette
David K Arrowsmith
Wolfram Just
QMUL London

- 0 Content
- 1 Nord Pool
- 2 Correlation analysis
- 3 Multifractal properties
- 4 Outlook



1 Nord Pool

electricity spot price
market data (← WP2)





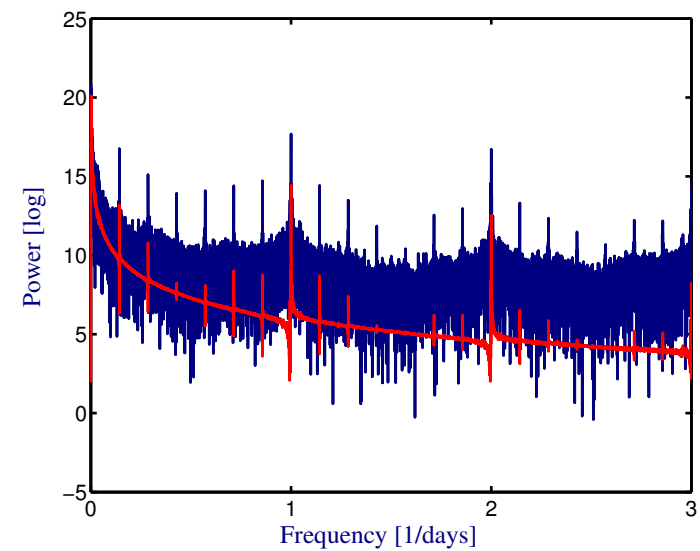
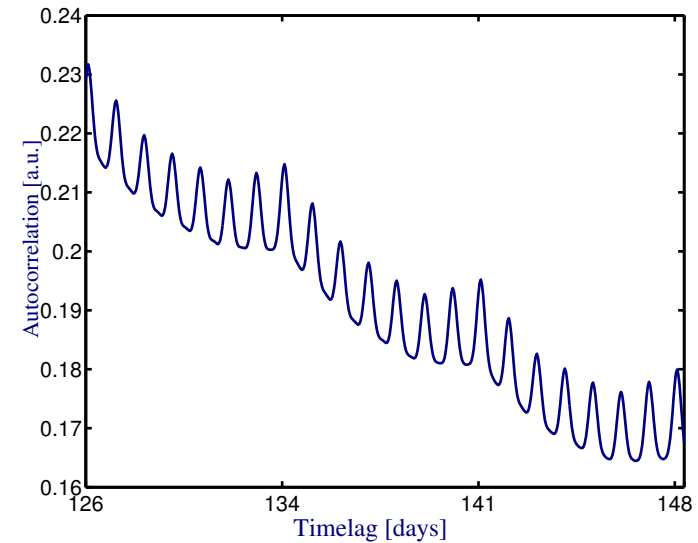
2 Correlation analysis

correlation function

$$C(n) = \frac{1}{N} \sum_{\ell} x_{\ell} x_{\ell+n}$$

power spectrum

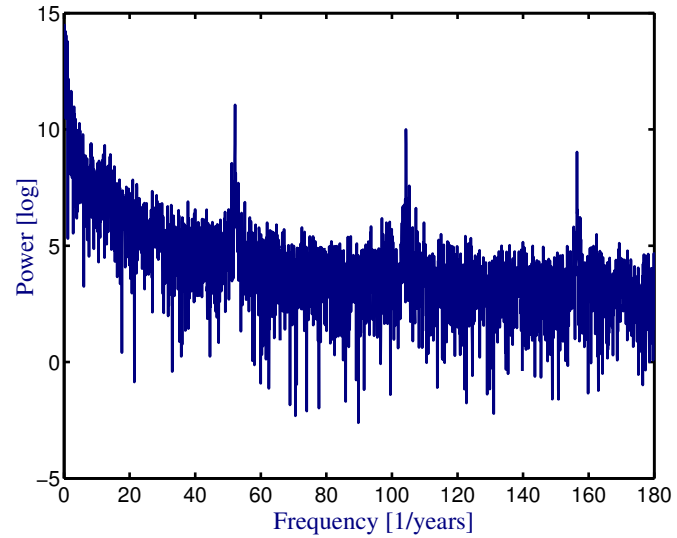
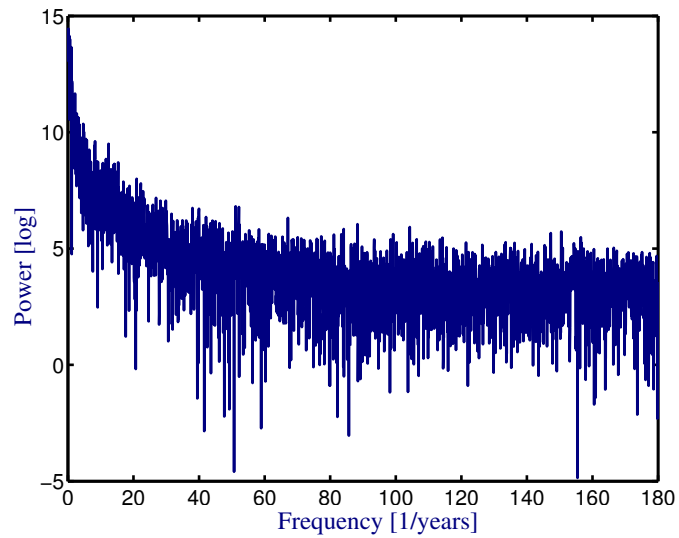
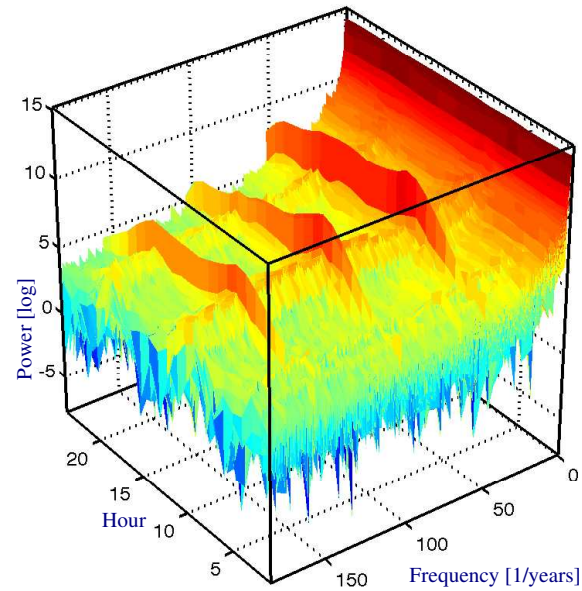
$$S(k) = \left| \sum_{\ell} x_{\ell} \exp(2\pi i k \ell / N) \right|^2$$





conditional
power spectra

$$x_l \rightarrow x_{24 \times l + h}$$



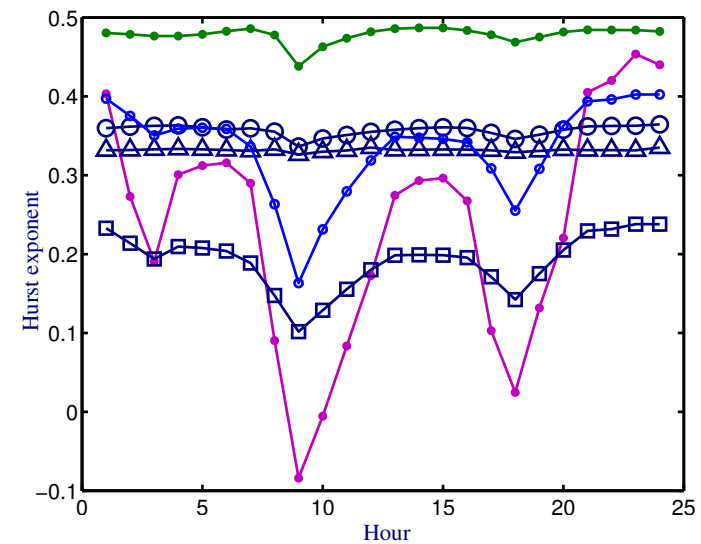
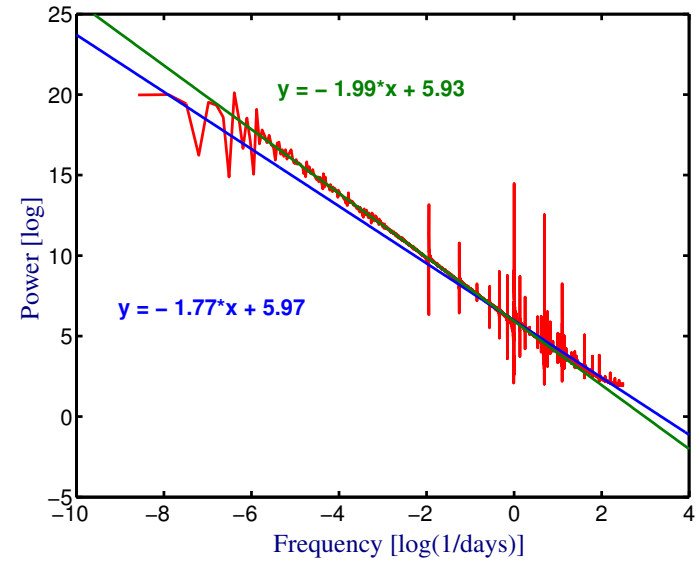


3 Multifractal properties

Hurst exponent (\rightarrow D3.1)

$$x(t) \sim \lambda^{-H} x(\lambda t)$$
$$\langle x^2(t) \rangle \sim t^{2H}$$
$$S(\omega) \sim \omega^{-1-2H}$$

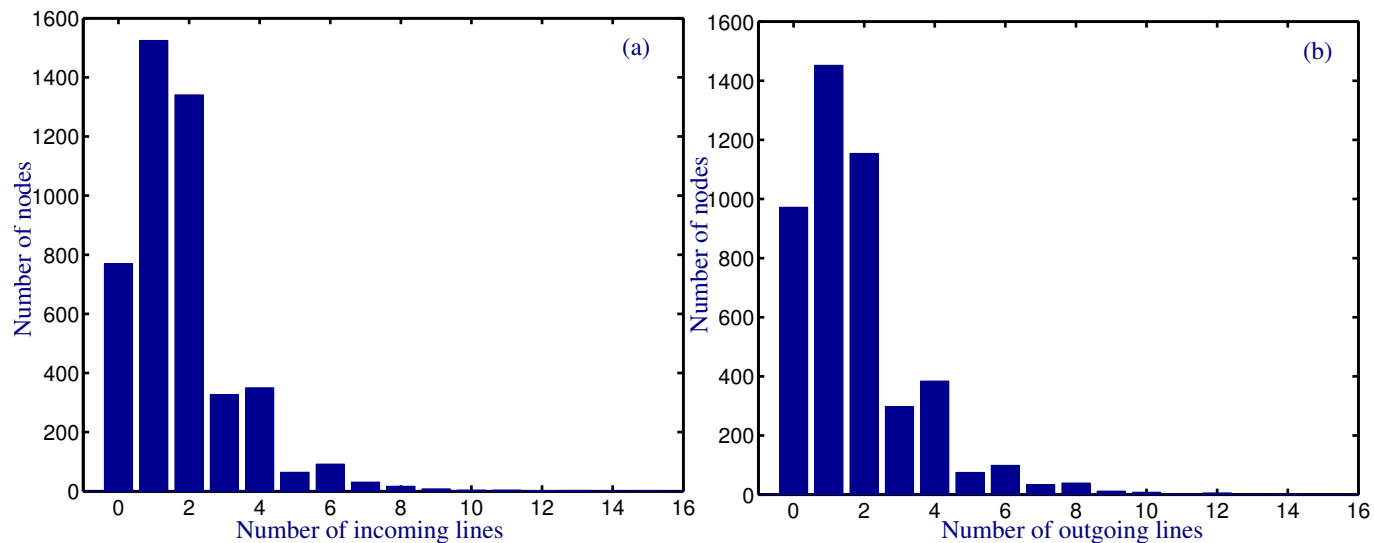
- R/S
- DMA
- MF-DFA



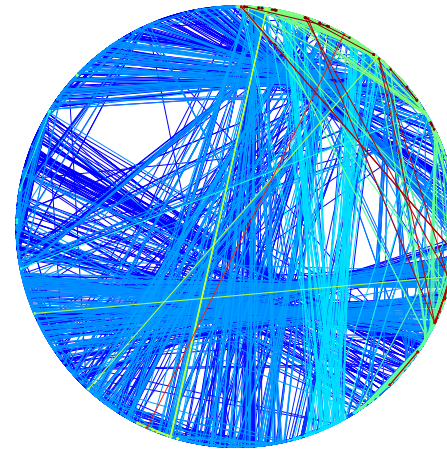
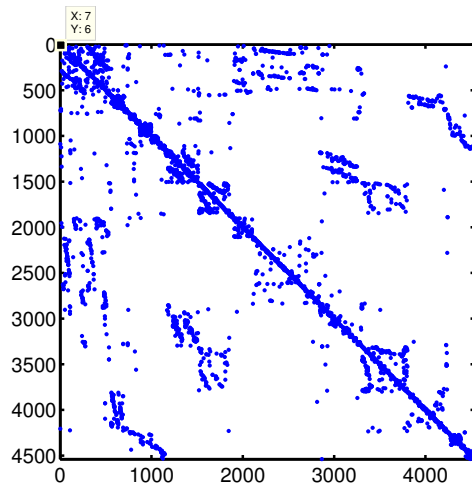


4 Outlook

- topology of power grid networks (← WP2, → D3.2)
 - basic topological measures (degree distribution, number of neighbours, degree correlation)



- network classification (regular, random, small-world, scale-free)



- advanced measures (average path length, clustering or transitivity, node betweenness or centrality, community structure)
- resilience and robustness of networks (→ D3.3)
 - robustness with regards to topology
 - reliance and efficiency
 - black-outs and network structure