

Review of the PhD thesis

Ms Andrea Kellová: „Statistical Approaches to Short-Term Electricity Forecasting“

a) Rate an author's original contribution –

I consider the submitted thesis as author's original contribution to development of multivariate forecasting models, both linear and nonlinear ones, devoted mainly to short-term prediction of electricity power demand, which is undoubtedly a problem of high and urgent practical importance. The models developed in thesis are based generally upon linear regression framework, and/or artificial neural networks, respectively. The thesis is divided into five chapters.

The first chapter, Chap.1., gives a short introduction into main aspects and problems of electric power industry from economic point of view, i.e. discussion of various market types ranging from monopoly to wholesale electricity markets, overview and comparison of available mathematical models suitable for forecasting of electricity demand, discussion of available CZ hour-base-data, etc.

The Chap.3 and 4 constitute the main part of submitted dissertation. I consider it to be an equilibrated and consistent coalition of both analytic formulation of various electricity demand forecasting models and author's original results obtained therewith. The exposition starts with additive and multiplicative representations of electricity demand functions. Further, the main electricity demand characteristics detected empirically are discussed in detail together with corresponding determining factors. In particular, weather variables enable to accept temperature changes during winter and summer season upon electricity demand, where as calendar variables are used to express typical week seasonalities, lagged electricity demand data provide platform for incorporation of history in econometric models, and various effects caused by electricity prices are investigated thoroughly. Short, but very useful is Sec. 3.2.5, which is devoted to interactions among variables considered in elaborated models. Finally, Sec. 3.3 describes problem oriented forecasting procedures in wording.

Chap. 4 is divided into six sections. All of them are unified by the main dissertation motivation idea, i.e. search for the most appropriate forecasting model applicable on the CZ electricity demand data. ANN serves as a basic platform providing nonlinear modelling tools for building the models. In particular, there is a feed-forward ANN with single output layer, one hidden layer with 3 nodes and logistic activation functions, which was presented in detail. Before discussion rather popular linear regression models, various forecast accuracy measures are introduced and formulated in analytic forms, in order to evaluate performance of elaborated models. Since various dynamic effects are to be incorporated in the models, the basic LRM is generalized with six-order autoregressive process. The dissertation issues are summarized in Sec. 4.6 providing an overview of models performance, and further stressed in Chap. 5 – conclusion.

b) Rate an usage of topic relevant resources –

Inspecting and evaluating the list of resources being attached in the thesis, as well as the way of citations, their frequency and topic relevance of links, I think the author has collected and studied very good, professionally relevant, and currently available resources, i.e. books, journal articles, proceedings, and internet resources, too.

c) Rate a chance to defend the thesis at prestigious university abroad –

In general, on the base of my thorough review I may think the submitted thesis is ready to be defended at a prestigious university abroad.

d) Rate a chance to publish results and/or parts of the thesis in impacted economic journals – I would recommend for publishing all results and analyses presented in the thesis core chapters, i.e. Chap. 3 and 4, of course, with a proper introduction and background of CZ electricity market.

e) Comments and remarks –

In general, I do appreciate the thesis is written in cultivated and skilled english, and any misprint haven't been detected.

Further, I also appreciate a precise definition of electricity market participant. However, I've missed a list of notations and mathematical symbols used.

Conclusion:

Concluding all points of my review I recommend –

- a) to proceed the submitted thesis for presentation and public defence at the Center for Economics Research and Graduate Education, Charles University in Prague,
- b) two questions to be discussed during this presentation and public defence:
 - i) How day-type forecast comparison results of model performances may change when comparing winter (i.e. Table 11) season with the summer one (if the analysis has been already done),
 - ii) How to adopt TAR models for analysis sudden changes of electric power prices,
- c) after successful presentation and public defence of the submitted thesis, the academic title Ph.D. to be earned by the thesis author, Ms Andrea Kellová.

Review elaborated by:

in Pilsen, 2008-02-24

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Questions:

- Peak price often in summer, when lowest demand
- observe limit of the capacity?
- weather forecast included? Or just correct generation
Do you know models using this?
Is it helpful if $weather(t) = weather(t-1)$