

# Report on Bachelor / Master Thesis

Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague

Student:	Bc. Ing. Vladimír Kunc
Advisor:	doc. PhDr. Ladislav Křišťoufek, Ph.D.
Title of the thesis:	Comparison of different models for forecasting of Czech electricity market

## **OVERALL ASSESSMENT** *(provided in English, Czech, or Slovak):*

The aim of the thesis is to compare different modeling approaches for predicting electricity price with the focus on the Czech electricity market. The thesis deals with a rather large extent of possible models such as artificial neural networks models, regression models and other machine learning models, overall the work compares up to 5000 estimators.

### **Literature**

In the first section, the author provides a brief but sufficient review of related literature including an useful table summary of different methods used in research papers, i.e. statistical models (such as ARIMA class, OLS regression) and artificial neural networks models. Though the chapter is short it gets straight to the point and provides the reader with clear state of the art. The chapter is well organized and informative.

### **Methods**

The third chapter presents methods starting with hyperparameters optimization encompassing three approaches - grid search, particle-swarm optimization and Nelder-Mead simplex method. I appreciate that the chapter is nicely structured and in each case presents usage and algorithm which is useful for a researcher searching for a work providing overview of possible modeling approaches such as this thesis. Then the chapter continues with an exhaustive description of various estimators and finishes with forecast evaluation.

The next chapter describes data of hourly marginal electricity prices in EUR/MWh from 2009/1 to 2017/5, volumes bought and sold as well as exports/imports. The author attached the dataset which is very welcomed. Figures provided in the chapter are very eye-catching, however, should the thesis be printed out in gray scale I am afraid that the clarity would be lost, thus I suggest using other means of distinguishing lines and areas such as different patterns.

In the fifth part the author evaluates the performance of various modeling approaches using the data. The section 5.1 is overly dense and detailed although clearly written. I appreciate more sections 5.2 and 5.3 summarizing the performance of the best estimators from each class and setting hypotheses such as the relevance of including weather variables.

### **Contribution**

Often the problem with bachelor and diploma theses lies in the the fact that the contribution is not highlighted enough. This is not a problem in this particular case since the contribution to the literature in the field is clearly stated and appropriately justified. It is obvious that the author spent a considerable amount of time both studying relevant articles and writing the thesis itself. The work is useful not only for the author but also for a wide audience of energy economists. I would suggest rewriting the thesis into an article at some point in the future since I consider it to be a very good piece of work.

### **Manuscript form**

The form of the thesis is very good, I do not have any major complaints. My only minor suggestion is to remove unnecessary blank pages which are in the thesis.

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Overall, I think that the thesis fulfills all formal requirements and I recommend it for the defense suggesting the grade A (výborně, 1).

## **SUMMARY OF POINTS AWARDED** (for details, see below):

CATEGORY	POINTS
Contribution (max. 30 points)	28
Methods (max. 30 points)	29
Literature (max. 20 points)	20
Manuscript Form (max. 20 points)	49
<b>TOTAL POINTS</b> (max. 100 points)	<b>96</b>
<b>GRADE</b> (1 – 2 – 3 – 4)	<b>1</b>

**NAME OF THE REFEREE:** Mgr. Vědunka Kopečná

**DATE OF EVALUATION:** 5.9.2017

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**Referee Signature**

**EXPLANATION OF CATEGORIES AND SCALE:**

**LITERATURE REVIEW:** *The thesis demonstrates author's full understanding and command of recent literature. The author quotes relevant literature in a proper way.*

Strong	Average	Weak
20	10	0

**METHODS:** *The tools used are relevant to the research question being investigated, and adequate to the author's level of studies. The thesis topic is comprehensively analyzed.*

Strong	Average	Weak
30	15	0

**CONTRIBUTION:** *The author presents original ideas on the topic demonstrating critical thinking and ability to draw conclusions based on the knowledge of relevant theory and empirics. There is a distinct value added of the thesis.*

Strong	Average	Weak
30	15	0

**MANUSCRIPT FORM:** *The thesis is well structured. The student uses appropriate language and style, including academic format for graphs and tables. The text effectively refers to graphs and tables and disposes with a complete bibliography.*

Strong	Average	Weak
20	10	0

**Overall grading:**

TOTAL POINTS	GRADE		
81 – 100	1	= excellent	= výborně
61 – 80	2	= good	= velmi dobře
41 – 60	3	= satisfactory	= dobře
0 – 40	4	= fail	= nedoporučuji k obhajobě