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The Romanian energy system structure and its impact on the electricity spot market

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Abstract

The international economic literature offers a significant number of publications approaching the European energy markets functioning, including comparative studies. The development and performances of the Romanian electricity spot market were less investigated, mainly because of the relatively short period of its functioning.

The paper quantifies the impact of the electricity generation utilities' structure by primary energy resources, on bidding prices resulted after the closure of the day ahead market. The multidimensional regression method was utilized for the models development. As a result, three distinct econometric models were obtained for different hourly periods of the day (off peak hours, peak hours, daily average) for working days and other three models for the weekend days. Based on these models, negative and positive correlations were established between the electricity prices and the seasonal contribution of the different categories of energy facilities to the demand curve coverage.

Keywords: Electricity spot market, bidding prices, peak/off peak and daily average prices

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1. Introduction

In this paper an evaluation model was developed in order determinate the influence of the electricity generation capacities' structure by primary energy resources (coal, hydrocarbons, hydro energy, nuclear and wind) on closure prices of the spot electricity market.

2. Literature review

As until now there are no viable solutions to economically store the electricity. Consequently, demand is the determinant factor for the price level, inducing unpredictable variations resulting from the specificity of the consumption model.

(Voronin and Partanen.,2012) developed a hibrid prediction model in order to forecast the energy prices based on the data series that characterize the Nordic electricity market. The novelty of this approach is the distinction made between the normal prices and the spike ones. In the first case, the authors use the ARMA model to assess the linear correlations between the electricity prices and the explicative variable, the GARCH model to define the heteroscedasticity of the residues and a neuronal network for the combination of the forecasts resulted from the two mentioned models with the historical prices and the demand evolution. All this process is developed with the purpose of generating a prognosis for the spike prices.

(Liebl, 2010) uses the functional analysis of the spike prices determined by the spot electricity markets. The functional perspective interprets the spot prices as electricity demand functions and allows for an estimation of a single daily price curve. Karakatsani and Bunn (2008) model and forecast the spot prices of the United Kingdom electricity market (UK Power Exchange), dividing the statistical data in trade periods and in daily samples each of 48 half hours, and the week days in working and weekends.

The majority of electricity prices forecasting models offer reasonable results for the prices situated in normal limits, but are not able to depict the effects of the prices that surpass these limits, the so called spike prices. The appearance of the latter ones is determined by a huge number of very complex factors.

On ideal competitive electricity markets, the spike prices appear only when demand is higher than supply. Yet, markets do not function ideally. Therefore, the spike prices happen even under the circumstance when the offer covers the demand. Zhao and Dong (2007), in their case study for the Australian electricity market utilizes the composite correlation between the spot price and the demand and supply with the Supply Demand Balance Index.

3. Research method

In order to determine the influence of the different kinds of energy resources utilized for electricity generation on its prices, statistical data were analyzed. The data refer to the average daily energy productions (www.transelectrica.ro) and the day ahead electricity prices for the 12 months of the 2012 year. (www.opcom.ro).

The primary data base consists of the following indicators:

- The average installed capacity of the coal based generation units (MW);
- The average installed capacity of the hydrocarbon based generation units (MW);
- The average installed capacity of the nuclear generation units (MW);
- The average installed capacity of the wind farms (MW);
- The average installed capacity of the hydro energy units (MW);
- The electricity daily average prices determined for the 1-24 hours (lei/MWh);
- The electricity average prices resulted from the spot market transactions in peak hours 7-22 (lei/MWh);
- The electricity average prices resulted from the spot market transactions in off peak hours 1-6 and 23-24 (lei/MWh).

The analysis was conducted for the 2012 year, from January to December, daily from Monday to Thursday and on Sunday. Fridays and Saturdays were not considered because there is no data available for those days. Six sub-