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Medium-term risk analysis in electricity markets: A decision-tree approach

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Abstract— Purpose – The purpose of this paper is to analyze medium-term risks faced by electrical generation companies in competitive environments. Market risks faced by generation companies are caused by several variables subject to uncertainty. Hydro conditions, fuel (coal and natural gas) prices, system demand, and CO2 emission price are the risk factors considered in the paper. Taking into account these risk factors, generation companies have to take decisions that would affect their economic results and their risk exposure.
Design/methodology/approach – This paper proposes a methodology to support the risk-analysis decision-making process. Firstly, different scenarios of risk factors are generated. Then, a market equilibrium model is used in order to assess the impact of the different sources of uncertainty. Finally, decision trees are used in order to analyze the variables subject to interest, such as electricity prices or companies’ profits.
Research limitations/implications – The proposed methodology can be enhanced to take into account scenarios of more risk factors, such as equipment failure or agents’ behavior. Another future enhancement could be a detailed study of correlation between different risk factors.
Findings – A realistic case study is presented, showing the advantages of these techniques for medium-term risk-analysis and decision-making processes. Several decision trees have been generated to assess the impact of the different risk factors in electricity prices and companies’ profits. These decision trees provide valuable information for companies when facing their risk-management process.
Originality/value – The approach presented here constitutes a valuable support to gain useful information for wise decision making and to hedge against risk.

Index Terms— Decision trees, Risk analysis

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