



Agent-based retail competition and portfolio optimization in liberalized electricity markets: A study involving real-world consumers

Hugo Algarvio, Fernando Lopes

LNEG—National Laboratory of Energy and Geology, 1649-038 Lisbon, Portugal

Full paper: <https://zenodo.org/record/5806146#.Yvzb6n3MKM8>

Summary

In the retail sector, retailers compete to sign bilateral contracts with end-use customers. Typically, such contracts are subject to a high-risk premium—that is, retailers request a high premium to consumers to cover their potential risk of trading energy in wholesale markets. Accordingly, consumers pay a price for energy typically higher than the wholesale market price. This article addresses the optimization of the portfolios of retailers, which are composed of end-use customers. To this end, it makes use of a risk-return optimization model based on the Markowitz theory. The article presents a simulation-based study conducted with the help of the MATREM system, involving 6 retailer agents, with different risk preferences, and 312 real-world consumers. The retailers select a pricing strategy and compute a tariff to offer to target consumers, optimize their portfolio of consumers using data from the Iberian market, sign bilateral contracts with consumers, and compute their target return during contract duration. The results support the conclusion that retail markets are more favourable to risk-seeking retailers, since substantial variations in return lead to small variations in risk. However, for a given target return, risk-averse retailers consider lower risk portfolios, meaning that they may obtain higher returns in both favourable and unfavourable situations.

Highlights

- A study and agent-based simulation of the retailers' behaviour in retail electricity markets;
- The adaptation of the retailers' portfolio of consumers dual-objective optimization model to maximize the return and minimize the risk of the portfolio according to the risk attitude of the retailer. The equipment of agent-based retailers with the aforementioned optimisation model, trading strategies, and forecast methodologies;
- Description and simulation of a formal model of an agent-based retail competition.



Info

The TradeRES project will develop and test innovative electricity market designs that can meet society's needs of a (near) 100% renewable power system. The market design will be tested in a sophisticated simulation environment in which real-world characteristics such as actors' limited foresight into the future and risk aversion are included.



<https://traderes.eu>
info@TradeRES.eu

Start date
1 February 2020

End date
31 January 2024

Overall budget: € 3 988 713,75



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 864276