

Editorial

Editorial for the Special Issue on ‘Agent-Based Artificial Markets’

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Nowadays, economics and finance gain a real advantage from a tremendous stream of innovations, notably coming from the computer science community. Recent advantage in information technologies employed in stock markets allow traders to analyze fundamental information, make trading decision, and submit orders in fractions of a second. This phenomenon impacts market quality, increases message traffic, makes market data extremely difficult to analyze, and requires effective regulatory design. Of course, other disciplines also rely on the notion of the market, and are impacted in the same way. Smart-grid, agent-based modeling, technical methods and smart order routing help the academy, industry, government and authorities to reach a deeper understanding of markets as a complex system.

This special issue of the journal *Information* focuses on the application of agents and multi-agent systems as well as all techniques in artificial intelligence applied to market issues. In particular, it shows how the agent-based approach is gradually impacting many areas of research, whether in finance, economics or smart-grids. These agents, driven by behaviours, make it possible to establish a link between the macroscopic level and the microscopic level of the phenomenon studied. The artificial market then serves as an environment in which agents can deploy their own strategies. One of the advantages of this approach, and not the least, is that it allows a behavioural differentiation closer to reality than conventional approaches.

In the paper entitled “An Agent-Based Approach to Interbank Market Lending Decisions and Risk Implications” [1], the authors examine the relationship of bank-level lending and borrowing decisions and the risk preferences on the dynamics of the interbank lending market. They develop an agent-based model that incorporates individual bank decisions using the temporal difference reinforcement learning algorithm with empirical data of 6600 U.S. banks. Their model can successfully replicate the key characteristics of interbank lending and borrowing relationships documented in the recent literature. A key finding of this study is that risk preferences at the individual bank level can lead to unique interbank market structures that are suggestive of the capacity with which the market responds to surprising shocks.

In another paper entitled “A Market-Based Optimization Approach for Domestic Thermal and Electricity Energy Management System: Formulation and Assessment” [2], the authors propose to overcome the “24 h-schedule” weakness of papers that propose to optimize electrical and thermal energy at a house level using a home-energy management system (HEMS) in order to minimize energy costs. They introduces a domestic thermal and electrical control based on a market approach. In contrast with the optimization-based HEMS, the market-based approach proposed in this paper targets a scalable and reactive optimal control. The authors formulate the market-based optimization problem with generality and discuss its optimality conditions with regards to microeconomic theory. Secondly, they compare its optimality to an optimization-based approach and a rule-based approach under forecast errors using Monte Carlo simulations. Finally, they quantify and identify the effectiveness boundaries of the different approaches.

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References

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