



Agent-based Simulation of Financial Markets



Book Simulation Financial Markets Agent Based Model

**Anthony Brabazon, Michael
O'Neill, Dietmar G. Maringer**

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Realistic Simulation of Financial Markets Hajime Kita,Kazuhisa Taniguchi,Yoshihiro Nakajima,2016-07-06 This book takes up unique agent based approaches to solving problems related to stock and their derivative markets Toward this end the authors have worked for more than 15 years on the development of an artificial market simulator called U Mart for use as a research and educational tool A noteworthy feature of the U Mart simulator compared to other artificial market simulators is that U Mart is an ultra realistic artificial stock and their derivative market simulator For example it can simulate arrowhead a next generation trading system used in the Tokyo Stock Exchange and other major markets as it takes into consideration the institutional design of the entire market Another interesting feature of the U Mart simulator is that it permits both human and computer programs to participate simultaneously as traders in the artificial market In this book first the details of U Mart are explained enabling readers to install and run the simulator on their computers for research and educational purposes The simulator thus can be used for gaming simulation of the artificial market and even for users as agents to implement their own trading strategies for agent based simulation ABS The book also presents selected research cases using the U Mart simulator Here topics include automated acquisition of trading strategy using artificial intelligence techniques evaluation of a market maker system to treat thin markets such as those for small and regional businesses systemic risk analysis of the financial market considering institutional design of the market and analysis of how humans behave and learn in gaming simulation New perspectives on artificial market research are provided and the power potential and challenge of ABS are discussed As explained in this important work ABS is considered to be an effective tool as the third approach of social science an alternative to traditional literary and mathematical approaches

Simulation of Financial Markets with Agent-Based Model Hajime Kita,Kazuhisa Taniguchi,Yoshihiro Nakajima,2015-12-25 This book takes up unique agent based approaches to solving problems related to stock and their derivative markets Toward this end the authors have worked for more than 15 years on the development of an artificial market simulator called U Mart for use as a research and educational tool A noteworthy feature of the U Mart simulator compared to other artificial market simulators is that U Mart is an ultra realistic artificial stock and their derivative market simulator For example it can simulate arrowhead a next generation trading system used in the Tokyo Stock Exchange and other major markets as it takes into consideration the institutional design of the entire market Another interesting feature of the U Mart simulator is that it permits both human and computer programs to participate simultaneously as traders in the artificial market In this book first the details of U Mart are explained enabling readers to install and run the simulator on their computers for research and educational purposes The simulator thus can be used for gaming simulation of the artificial market and even for users as agents to implement their own trading strategies for agent based simulation ABS The book also presents selected research cases using the U Mart simulator Here topics include automated acquisition of trading strategy using artificial intelligence techniques

evaluation of a market maker system to treat thin markets such as those for small and regional businesses systemic risk analysis of the financial market considering institutional design of the market and analysis of how humans behave and learn in gaming simulation New perspectives on artificial market research are provided and the power potential and challenge of ABS are discussed As explained in this important work ABS is considered to be an effective tool as the third approach of social science an alternative to traditional literary and mathematical approaches

Financial Market Design by an Agent-Based Model Takanobu Mizuta,Isao Yagi,2025-02-10 This is the first book to focus on designing a financial market that works well and that includes making and or modulating detailed regulations and or rules by a computer simulation of an agent based artificial financial market model ABAFMM The design of a financial market is very important for the development and maintenance of an advanced economy but designing it is not easy because changes in detailed rules even those that seem trivial sometimes have unexpectedly large impacts and side effects in a financial market which is a complex system Traditional economics cannot treat a financial market as a complex system in which micro macro interaction and feedback loops have played essential roles because traditional economics can only treat macrophenomena and micro processes separately ABAFMM can do it however This book explains first why ABAFMMs are needed to design financial markets and which models have good features Following that explanation the book discusses how to build the models Then cases of recent studies and their contributions are shown and finally the difficulties of researchers in this field are considered This book is expected to facilitate the design of more ABAFMMs to contribute to creating financial markets that will further develop and maintain advanced economies

Agent-based Models of the Economy R. Boero,M. Morini,M. Sonnessa,P. Terna,2015-06-16 Agent based models are tools that provide researchers in economic fields with unprecedented analytical capabilities This book describes the power of agent based models along their methodology and it provides several examples of applications spanning from public policy evaluation to financial markets

Agent-Based Modeling Norman Ehrentreich,2007-10-25 This book reconciles the existence of technical trading with the Efficient Market Hypothesis By analyzing a well known agent based model the Santa Fe Institute Artificial Stock Market SFI ASM it finds that when selective forces are weak financial evolution cannot guarantee that only the fittest trading rules will survive Its main contribution lies in the application of standard results from population genetics which have widely been neglected in the agent based community

Artificial Economics Roman sperka,2015-10-09 Agent technology with the methods of modeling and simulation ABMS has recently become a platform for research in a broad range of applied economic disciplines The use of ABMS techniques is possible due to the availability of sufficient computing performance under current information technology progress Multi agent systems allow the simulation to work with some degree of local intelligence causality probability and market failures The subject of this book is the use of ABMS in financial markets Trading with financial assets is widely used in developed economies As a result of the interaction of a supply and a demand the prices of these assets

bonds cash shares etc change relatively quickly Price volatility is caused by a large number of factors affecting the demand and supply of financial assets The book is divided into three parts Part One characterizes modeling and simulation methods Part Two introduces financial market structure trading behavior and financial market simulation approaches Applied research of the financial markets and the determination of a proper taxation is demonstrated in the Case study which forms Part Three of this book

Nasdaq Market Simulation, A: Insights On A Major Market From The Science Of Complex Adaptive Systems Vincent Darley,Alexander V Outkin,2007-03-21 This pioneering book describes the applications of agent based modeling to financial markets It presents a new paradigm for finance where markets are treated as complex systems whose behavior emerges as a result of interactions of market participants market institutions and market rules This includes both a presentation of the conceptual model and its software implementation It also summarises the result of the profound research on the successful practical application of this new approach to answer questions regarding the NASDAQ Stock Market s decimalization that was implemented in 2001 The book presents conceptual foundations for modeling markets as complex systems It describes the agent based model of the NASDAQ stock market including strategies used by market makers and investors market participants interactions and impacts of rules and regulations It includes analyses of simulation behavior comparison with the behaviors observed in the real world markets existence of fat tails spread clustering etc and predictions about possible outcomes of decimalization A framework for calibrating the market behavior and individual market makers strategies to historical data is also presented

Advances in Practical Applications of Agents and Multiagent Systems Yves Demazeau,Frank Dignum,Juan Manuel Corchado Rodríguez,Javier Bajo,2010-04-15 PAAMS the International Conference on Practical Applications of Agents and Multi Agent Systems is an international yearly stage to present to discuss and to disseminate the latest advances and the most important outcomes related to real world applications It provides a unique opportunity to bring multi disciplinary experts academics and practitioners together to exchange their experience in the development of Agents and Multi Agent Systems This volume presents the papers that have been accepted for the 2010 edition These articles capture the most innovative results and this year s advances Each paper has been reviewed by three different reviewers from an international com mittee composed of 82 members from 26 different countries From the 66 submissions received 19 were selected for full presentation at the conference and 14 were accepted as short papers Moreover PAAMS 10 incorporated special ses sions and workshops to complement the regular program which included 85 ac cepted papers

Network Theory and Agent-Based Modeling in Economics and Finance Anindya S. Chakrabarti,Lukáš Pichl,Taisei Kaizoji,2019-10-23 This book presents the latest findings on network theory and agent based modeling of economic and financial phenomena In this context the economy is depicted as a complex system consisting of heterogeneous agents that interact through evolving networks the aggregate behavior of the economy arises out of billions of small scale interactions that take place via countless economic agents The book focuses on analytical modeling and on the

econometric and statistical analysis of the properties emerging from microscopic interactions. In particular, it highlights the latest empirical and theoretical advances helping readers understand economic and financial networks as well as new work on modeling behavior using rich agent based frameworks. Innovatively the book combines observational and theoretical insights in the form of networks and agent based models both of which have proved to be extremely valuable in understanding non linear and evolving complex systems. Given its scope the book will capture the interest of graduate students and researchers from various disciplines e.g. economics, computer science, physics and applied mathematics whose work involves the domain of complexity theory. A NASDAQ Market Simulation Vincent Darley, 2007 This pioneering book describes the applications of agent based modeling to financial markets. It presents a new paradigm for finance where markets are treated as complex systems whose behavior emerges as a result of interactions of market participants, market institutions and market rules. This includes both a presentation of the conceptual model and its software implementation. It also summarises the result of the profound research on the successful practical application of this new approach to answer questions regarding the Nasdaq Stock Market's decimalization that was implemented in 2001. The book presents conceptual foundations for modeling markets as complex systems. It describes the agent based model of the Nasdaq stock market including strategies used by market makers and investors, market participants interactions and impacts of rules and regulations. It includes analyses of simulation behavior comparison with the behaviors observed in the real world markets, existence of fat tails, spread clustering etc and predictions about possible outcomes of decimalization. A framework for calibrating the market behavior and individual market makers strategies to historical data is also presented. Agent-Based Simulation: From Modeling Methodologies to Real-World Applications Takao Terano, Hajime Kita, Toshiyuki Kaneda, Kiyoshi Arai, Hiroshi Deguchi, 2005-08-03 Agent based modeling simulation is an emerging field that uses bottom up and experimental analysis in the social sciences. Selected research from that presented at the Third International Workshop on Agent Based Approaches in Economic and Social Complex Systems 2004 held in May 2004 in Kyoto Japan is included in this book. The aim of the workshop was to employ the bottom up approach to social and economic problems by modeling simulation and analysis using a software agent. This research area is an emerging interdisciplinary field among the social sciences and computer science attracting broad attention because it introduces a simulation based experimental approach to problems that are becoming increasingly complex in an era of globalization and innovation in information technology. The state of the art research and findings presented in this book will be indispensable tools for anyone involved in this rapidly growing discipline.

Innovative Approaches in Agent-Based Modelling and Business Intelligence Setsuya Kurahashi, Hiroshi Takahashi, 2018-12-08 This book thoroughly prepares intermediate level readers for research in social science organization studies, economics, finance, marketing science and business science as complex adaptive systems. It presents the advantages of social simulation studies and business intelligence to those who are not familiar with the computational research approach.

and offers experienced modelers various instructive examples of using agent based modeling and business intelligence approaches to inspire their own work In addition the book discusses cutting edge techniques for complex adaptive systems using their applications To date business science studies have focused only on data science and analyses of business problems However using these studies to enhance the capabilities of conventional techniques in the fields has not been investigated adequately This book addresses managing the issues of societies firms and organizations to profit from interaction with agent based modeling human and computer mixed systems and business intelligence approaches an area that is fundamental for complex but bounded rational business environments With detailed research by leading authors in the field Innovative Approaches in Agent Based Modelling and Business Intelligence inspires readers to join with other disciplines and extend the scope of the book with their own unique contributions It also includes the common challenges encountered in computational social science and business science to enable researchers students and professionals to resolve their own problems

Simulation of Financial Markets by Agent-Based Mix-Game Model Chengling Gou,2005 This paper studies the simulation of financial markets by agent based mix game model which is a variant of minority game MG It specifies the spectrums of parameters of mix game model which fit financial markets by looking at the dynamic behaviors of mix game model under its comprehensive spectrums of parameters Then it induces the rules for simulating financial markets by mix game models and gives an example of simulating financial market by mix game model

Quantitative Methods for Economics and Finance J.E. Trinidad-Segovia,Miguel Ángel Sánchez-Granero,2021-02-12 This book is a collection of papers for the Special Issue Quantitative Methods for Economics and Finance of the journal Mathematics This Special Issue reflects on the latest developments in different fields of economics and finance where mathematics plays a significant role The book gathers 19 papers on topics such as volatility clusters and volatility dynamic forecasting stocks indexes cryptocurrencies and commodities trade agreements the relationship between volume and price trading strategies efficiency regression utility models fraud prediction or intertemporal choice

Natural Computing in Computational Finance Anthony Brabazon,Michael O'Neill,Dietmar G. Maringer,2010-06-09 The chapters in this book illustrate the application of a range of cutting edge natural computing and agent based methodologies in computational finance and economics The eleven chapters were selected following a rigorous peer reviewed selection process

An Agent-Based Financial Simulation for Use by Researchers Roy Hayes,2014 Regulators and policy makers facing a complicated fast paced and quickly evolving marketplace require new tools and decision aides to inform policy Agent based models which are capable of capturing the organization of exchanges intricacies of market mechanisms and the heterogeneity of market participants offer a powerful method for understanding the financial marketplace To this end we have worked to develop a flexible and adaptable agent based model of financial markets that can be extended and applied to interesting policy questions This paper presents the implementation of this model In addition it provides a small case study that demonstrates the possible uses of the model The source code of

the simulation has also been released and is available for use **Agent-Based Modeling** Norman Ehrentreich,2007-10-30 This book reconciles the existence of technical trading with the Efficient Market Hypothesis By analyzing a well known agent based model the Santa Fe Institute Artificial Stock Market SFI ASM it finds that when selective forces are weak financial evolution cannot guarantee that only the fittest trading rules will survive Its main contribution lies in the application of standard results from population genetics which have widely been neglected in the agent based community *Simulation in Computational Finance and Economics: Tools and Emerging Applications* Alexandrova-Kabadjova, Biliana,Martinez-Jaramillo, Serafin,Garcia-Almanza, Alma Lilia,Tsang, Edward,2012-08-31 Simulation has become a tool difficult to substitute in many scientific areas like manufacturing medicine telecommunications games etc Finance is one of such areas where simulation is a commonly used tool for example we can find Monte Carlo simulation in many financial applications like market risk analysis portfolio optimization credit risk related applications etc Simulation in Computational Finance and Economics Tools and Emerging Applications presents a thorough collection of works covering several rich and highly productive areas of research including Risk Management Agent Based Simulation and Payment Methods and Systems topics that have found new motivations after the strong recession experienced in the last few years Despite the fact that simulation is widely accepted as a prominent tool dealing with a simulation based project requires specific management abilities of the researchers Economic researchers will find an excellent reference to introduce them to the computational simulation models The works presented in this book can be used as an inspiration for economic researchers interested in creating their own computational models in their respective fields *Agent-Based Models of Financial Markets* Tomaso Poggio,2001 We construct a computer simulation of a repeated double auction market designed to match those in experimental market settings with human subjects to model complex interactions among artificially intelligent traders endowed with varying degrees of learning capabilities In the course of six different experimental designs we investigate a number of features of our agent based model the price efficiency of the market the speed at which prices converge to the rational expectations equilibrium price the dynamics of the distribution of wealth among the different types of AI agents trading volume bid ask spreads and other aspects of market dynamics We are able to replicate several endings of human based experimental markets however we also find intriguing differences between agent based and human based experiments **Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations for 2013: Commodity Futures Trading Commission; Farm Credit Administration** United States. Congress. House. Committee on Appropriations. Subcommittee on Agriculture, Rural Development, Food and Drug Administration, and Related Agencies,2012

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