

# Models with Heterogeneous Agents

## Introduction

Wouter J. Den Haan  
London School of Economics

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# Models With Heterogeneous Agents Introduction

**Konstantinos Giannakas**



## **Models With Heterogeneous Agents Introduction:**

Computational Economics: Heterogeneous Agent Modeling Cars Hommes, Blake LeBaron, 2018-06-27 Handbook of Computational Economics Heterogeneous Agent Modeling Volume Four focuses on heterogeneous agent models emphasizing recent advances in macroeconomics including DSGE finance empirical validation and experiments networks and related applications Capturing the advances made since the publication of Volume Two Tesfatsion Judd 2006 it provides high level literature with sections devoted to Macroeconomics Finance Empirical Validation and Experiments Networks and other applications including Innovation Diffusion in Heterogeneous Populations Market Design and Electricity Markets and a final section on Perspectives on Heterogeneity Helps readers fully understand the dynamic properties of realistically rendered economic systems Emphasizes detailed specifications of structural conditions institutional arrangements and behavioral dispositions Provides broad assessments that can lead researchers to recognize new synergies and opportunities

*Introduction to Quantitative Macroeconomics Using Julia* Petre Caraiani, 2018-08-29 Introduction to Quantitative Macroeconomics Using Julia From Basic to State of the Art Computational Techniques facilitates access to fundamental techniques in computational and quantitative macroeconomics It focuses on the recent and very promising software Julia which offers a MATLAB like language at speeds comparable to C Fortran also discussing modeling challenges that make quantitative macroeconomics dynamic a key feature that few books on the topic include for macroeconomists who need the basic tools to build solve and simulate macroeconomic models This book neatly fills the gap between intermediate macroeconomic books and modern DSGE models used in research Combines an introduction to Julia with the specific needs of macroeconomic students who are interested in DSGE models and PhD students and researchers interested in building DSGE models Teaches fundamental techniques in quantitative macroeconomics by introducing theoretical elements of key macroeconomic models and their potential algorithmic implementations Exposes researchers working in macroeconomics to state of the art computational techniques for simulating and solving DSGE models

*Introduction to Agent-Based Economics* Mauro Gallegati, Antonio Palestrini, Alberto Russo, 2017-08-03 Introduction to Agent Based Economics describes the principal elements of agent based computational economics ACE It illustrates ACE s theoretical foundations which are rooted in the application of the concept of complexity to the social sciences and it depicts its growth and development from a non linear out of equilibrium approach to a state of the art agent based macroeconomics The book helps readers gain a better understanding of the limits and perspectives of the ACE models and their capacity to reproduce economic phenomena and empirical patterns Reviews the literature of agent based computational economics Analyzes approaches to agents expectations Covers one of the few large macroeconomic agent based models the Modellaccio Illustrates both analytical and computational methodologies for producing tractable solutions of macro ACE models Describes diffusion and amplification mechanisms Depicts macroeconomic experiments related to ACE implementations

**An Introduction to Agent-Based**

**Modeling** Uri Wilensky, William Rand, 2015-04-17 A comprehensive and hands on introduction to the core concepts methods and applications of agent based modeling including detailed NetLogo examples The advent of widespread fast computing has enabled us to work on more complex problems and to build and analyze more complex models This book provides an introduction to one of the primary methodologies for research in this new field of knowledge Agent based modeling ABM offers a new way of doing science by conducting computer based experiments ABM is applicable to complex systems embedded in natural social and engineered contexts across domains that range from engineering to ecology An Introduction to Agent Based Modeling offers a comprehensive description of the core concepts methods and applications of ABM Its hands on approach with hundreds of examples and exercises using NetLogo enables readers to begin constructing models immediately regardless of experience or discipline The book first describes the nature and rationale of agent based modeling then presents the methodology for designing and building ABMs and finally discusses how to utilize ABMs to answer complex questions Features in each chapter include step by step guides to developing models in the main text text boxes with additional information and concepts end of chapter explorations and references and lists of relevant reading There is also an accompanying website with all the models and code

#### **Accounting for Agent Heterogeneity in Market and Policy**

**Analysis** Konstantinos Giannakas, 2018-12-19 This book presents a multi market framework of market and policy analysis that explicitly accounts for the empirically relevant heterogeneity in consumer preferences and producer characteristics The explicit consideration of consumer and producer heterogeneity represents a significant departure from the representative consumer and producer that have been at the center of most of the literature on market and policy analysis and enables the distributional impacts of changes in market conditions and policies to be fully identified The framework is used to analyze the system wide market and welfare impacts of a number of changes in market conditions like changes in consumer preferences costs and market structure and policies like subsidies and taxes on one of the products in the system Consistent with a priori expectations the use of the framework unveils impacts masked by the conventional market and policy analysis

**Machine Learning Perspectives of Agent-Based Models** Pedro Campos, Anand Rao, Joaquim Margarido, 2025-09-19 This book provides an overview of agent based modeling ABM and multi agent systems MAS emphasizing their significance in understanding complex economic systems with a special focus on the emerging properties of heterogeneous agents that cannot be deduced from the characteristics of individual agents ABM is highlighted as a powerful tool for studying economics especially in the context of financial crises and pandemics where traditional models such as dynamic stochastic general equilibrium DSGE models have proven inadequate Containing numerous practical examples and applications with R Python Julia and Netlogo the book explores how learning particularly machine learning can be integrated into multi agent systems to enhance the adaptation and behavior of agents in dynamic environments It compares different learning approaches including game theory and artificial intelligence highlighting the advantages of each in modeling economic phenomena

#### **Dynamic**

Social Networks in Agent-based Modelling Holzhauer, Sascha, 2017 Agent based modelling enables the explicit representation of entities and their interaction with each other and the environment and so it became an important method to study complex systems Social networks form an important part of agent based social simulation as they define the topology of agent interaction This dissertation initially identifies important properties of social networks and their dynamics and reviews their representation in agent based models of relevant domains A classification of levels of detail for the network modelling components initialisation dynamics of networks and dynamics on networks is proposed and guides the identification of deficits A formal iterative evaluation framework is developed to quantitatively assess network modelling approaches under a set of weighted criteria representativity adjustability validity and efficiency The framework is applied to an abstract model of opinion dynamics and to an empirically grounded model of social influence A lifestyle specific network survey is designed conducted and analysed and helps to ground the evaluation of the network modelling s representativity on empirical data The study finds significant differences of degree and distance distributions as well as in the composition of ego networks between lifestyles New network modelling approaches are developed to account for requirements in agent based models such as agent type specific link preferences degree and distance distributions community structures and interaction dynamics The comparison of simple to elaborated network modelling for the application models shows a significant impact on simulation results highlighting the need for informed decisions about suitable approaches **Dynamic General**

**Equilibrium Modeling** Burkhard Heer, Alfred Maussner, 2011-10-20 Modern business cycle theory and growth theory uses stochastic dynamic general equilibrium models In order to solve these models economists need to use many mathematical tools This book presents various methods in order to compute the dynamics of general equilibrium models In part I the representative agent stochastic growth model is solved with the help of value function iteration linear and linear quadratic approximation methods parameterised expectations and projection methods In order to apply these methods fundamentals from numerical analysis are reviewed in detail In particular the book discusses issues that are often neglected in existing work on computational methods e g how to find a good initial value In part II the authors discuss methods in order to solve heterogeneous agent economies In such economies the distribution of the individual state variables is endogenous This part of the book also serves as an introduction to the modern theory of distribution economics Applications include the dynamics of the income distribution over the business cycle or the overlapping generations model In an accompanying home page to this book computer codes to all applications can be downloaded *Agent-based Modeling and Network Dynamics* Akira

Namatame, Shu-Heng Chen, 2016 The book integrates agent based modeling and network science It is divided into three parts namely foundations primary dynamics on and of social networks and applications The authors begin with the network origin of agent based models known as cellular automata and introduce a number of classic models such as Schelling s segregation model and Axelrod s spatial game The text shows that the modern network science mainly driven by game theorists

and sociophysicists has inspired agent based social scientists to develop alternative formation algorithms known as agent based social networks     Heterogenous Agents, Interactions and Economic Performance Robin Cowan, Nicolas

Jonard, 2012-12-06 In traditional economics models of perfect competition agent s interactions are all mediated through the market Interactions are anonymous global and indirect This is a powerful model but we see many instances in which one and sometimes all of the previous characteristics fail to hold true The type of agent you are or your identity can affect the type of interaction we have and most surely the relationship between micro behaviour and macro phenomena in non trivial ways This book contains a selection of papers presented at the 6th Workshop on Economics with Heterogenous Interacting Agents WEHIA The contributions show that work done in other fields like evolutionary biology statistical mechanics social network theory and others help us to understand the way in which economic systems operate Virtually all of the papers presented in this volume draw on some aspect or other of these varied approaches to related problems     **Introduction to**

**Computational Economics Using Fortran** Hans Fehr, Fabian Kindermann, 2018 Introduction to Computational Economics Using Fortran is the essential guide to conducting economic research on a computer Aimed at students of all levels of education as well as advanced economic researchers it facilitates the first steps into writing programs using Fortran Introduction to Computational Economics Using Fortran assumes no prior experience as it introduces the reader to this programming language It shows the reader how to apply the most important numerical methods conducted by computational economists using the toolbox that accompanies this text It offers various examples from economics and finance organized in self contained chapters that speak to a diverse range of levels and academic backgrounds Each topic is supported by an explanation of the theoretical background a demonstration of how to implement the problem on the computer and a discussion of simulation results Readers can work through various exercises that promote practical experience and deepen their economic and technical insights This textbook is accompanied by a website from which readers can download all program codes as well as a numerical toolbox and receive technical information on how to install Fortran on their computer

*Ontology, Epistemology, and Teleology for Modeling and Simulation* Andreas Tolk, 2012-08-10 In this book internationally recognized experts in philosophy of science computer science and modeling and simulation are contributing to the discussion on how ontology epistemology and teleology will contribute to enable the next generation of intelligent modeling and simulation applications It is well understood that a simulation can provide the technical means to display the behavior of a system over time including following observed trends to predict future possible states but how reliable and trustworthy are such predictions The questions about what we can know ontology how we gain new knowledge epistemology and what we do with this knowledge teleology are therefore illuminated from these very different perspectives as each experts uses a different facet to look at these challenges The result of bringing these perspectives into one book is a challenging compendium that gives room for a spectrum of challenges from general philosophy questions such as can we use modeling

and simulation and other computational means at all to discover new knowledge down to computational methods to improve semantic interoperability between systems or methods addressing how to apply the recent insights of service oriented approaches to support distributed artificial intelligence As such this book has been compiled as an entry point to new domains for students scholars and practitioners and to raise the curiosity in them to learn more to fully address the topics of ontology epistemology and teleology from philosophical computational and conceptual viewpoints Handbook on Information Technology in Finance Detlef Seese, Christof Weinhardt, Frank Schlottmann, 2008-05-27 Why do we need a handbook on Information Technology IT and Finance At first because both IT as well as finance are some of the most prominent driving forces of our contemporary world Secondly because both areas develop with a terrific speed causing an urgent need of up to date information on recent developments Thirdly because serious applications of IT in Finance require specialists with a professional training and professional knowledge in both areas Over the last decades the world has seen many changes in politics economics science and legislation The driving forces behind many of these developments are of a technological nature One of the key technologies with this respect is Information Technology IT is the most prominent technology revolutionizing the industrial development from products and processes to services as well as finance which is itself one of the central pillars of modern economics The explosive development of the Internet emphasizes the importance of IT since it is today's key factor driving global access and availability of information and allows the division of labour on an international scale the globalization The profound transformation of finance and the financial industry over the last twenty years was driven by technological developments e.g. Learning in Economics Thomas Riechmann, 2012-12-06 It took me over five years to write this book Finishing my research project and thus finishing this book would not have been possible without the help of many friends of mine Thus the first thing to do is to say Thanks a lot This means at first place the Evangelisches Studienwerk Haus Villigst They gave me a grant for my work thus laying the important financial grounds of everything I've done There is such a large number of friends I worked and lived with over the last few years that I cannot possibly mention them all by name but I'll try anyway So thanks Christiane Gilbert Maik Karl and everybody else feeling that his or her name should appear in this list And of course thanks Franz Haslinger for letting me do whatever I wanted to and for even encouraging me to stick with it One more thing I'd like to mention Although this work is based on very heavy use of computer power it is my special pride to say that not a single penny i.e. Deutschmark had to be spent for software in order to do this work Instead all that has been done has been done by free software Thus I would like to mention some of my most heavily used software tools in order to let you the reader know that nowadays you don't depend on big commercial software packages any more Computational Science - ICCS 2021 Maciej Paszynski, Dieter Kranzlmüller, Valeria V. Krzhizhanovskaya, Jack J. Dongarra, Peter M.A. Sloot, 2021-06-10 The six volume set LNCS 12742 12743 12744 12745 12746 and 12747 constitutes the proceedings of the 21st International Conference on Computational Science ICCS 2021 held in

Krakow Poland in June 2021 The total of 260 full papers and 57 short papers presented in this book set were carefully reviewed and selected from 635 submissions 48 full and 14 short papers were accepted to the main track from 156 submissions 212 full and 43 short papers were accepted to the workshops thematic tracks from 479 submissions The papers were organized in topical sections named Part I ICCS Main Track Part II Advances in High Performance Computational Earth Sciences Applications and Frameworks Applications of Computational Methods in Artificial Intelligence and Machine Learning Artificial Intelligence and High Performance Computing for Advanced Simulations Biomedical and Bioinformatics Challenges for Computer Science Part III Classifier Learning from Difficult Data Computational Analysis of Complex Social Systems Computational Collective Intelligence Computational Health Part IV Computational Methods for Emerging Problems in dis Information Analysis Computational Methods in Smart Agriculture Computational Optimization Modelling and Simulation Computational Science in IoT and Smart Systems Part V Computer Graphics Image Processing and Artificial Intelligence Data Driven Computational Sciences Machine Learning and Data Assimilation for Dynamical Systems MeshFree Methods and Radial Basis Functions in Computational Sciences Multiscale Modelling and Simulation Part VI Quantum Computing Workshop Simulations of Flow and Transport Modeling Algorithms and Computation Smart Systems Bringing Together Computer Vision Sensor Networks and Machine Learning Software Engineering for Computational Science Solving Problems with Uncertainty Teaching Computational Science Uncertainty Quantification for Computational Models The conference was held virtually Frontiers of Business Cycle Research Thomas F. Cooley, 1995-02-26 This introduction to modern business cycle theory uses a neoclassical growth framework to study the economic fluctuations associated with the business cycle Presenting advances in dynamic economic theory and computational methods it applies concepts to t

*Multicriteria and Multiagent Decision Making with Applications to Economics and Social Sciences* Aldo G. S. Ventre, Antonio Maturo, Šárka Hošková-Mayerová, Janusz Kacprzyk, 2013-12-06 The book provides a comprehensive and timely report on the topic of decision making and decision analysis in economics and the social sciences The various contributions included in the book selected using a peer review process present important studies and research conducted in various countries around the globe The majority of these studies are concerned with the analysis modeling and formalization of the behavior of groups or committees that are in charge of making decisions of social and economic importance Decisions in these contexts have to meet precise coherence standards and achieve a significant degree of sharing consensus and acceptance even in uncertain and fuzzy environments This necessitates the confluence of several research fields such as foundations of social choice and decision making mathematics complexity psychology sociology and economics A large spectrum of problems that may be encountered during decision making and decision analysis in the areas of economics and the social sciences together with a broad range of tools and techniques that may be used to solve those problems are presented in detail in this book making it an ideal reference work for all those interested in analyzing and implementing



mathematical tools for application to relevant issues involving the economy and society      *Agent-Based Computational Economics* Shu-Heng Chen, 2017-09-19 This book aims to answer two questions that are fundamental to the study of agent based economic models what is agent based computational economics and why do we need agent based economic modelling of economy This book provides a review of the development of agent based computational economics ACE from a perspective on how artificial economic agents are designed under the influences of complex sciences experimental economics artificial intelligence evolutionary biology psychology anthropology and neuroscience This book begins with a historical review of ACE by tracing its origins From a modelling viewpoint ACE brings truly decentralized procedures into market analysis from a single market to the whole economy This book also reviews how experimental economics and artificial intelligence have shaped the development of ACE For the former the book discusses how ACE models can be used to analyse the economic consequences of cognitive capacity personality and cultural inheritance For the latter the book covers the various tools used to construct artificial adaptive agents including reinforcement learning fuzzy decision rules neural networks and evolutionary computation This book will be of interest to graduate students researching computational economics experimental economics behavioural economics and research methodology      **Inequality, Taxation, and Intergenerational Transmission** John A. Bishop, Juan Gabriel Rodríguez, 2018-12-14 Research on Economic Inequality volume 26 primarily contains papers presented at the 8th Society for the Study of Economic Inequality ECINEQ meeting The papers cover such topics as the effect of inheritance taxation on the pre distribution of income and tax progressivity under alternative inequality definitions

*Complex Networks & Their Applications V* Hocine Cherifi, Sabrina Gaito, Walter Quattrociocchi, Alessandra Sala, 2016-11-25 This book highlights cutting edge research in the field of network science offering scientists researchers and graduate students a unique opportunity to catch up on the latest advances in theory and a multitude of applications It presents the peer reviewed proceedings of the fifth International Workshop on Complex Networks Network measures Community structure Network dynamics Diffusion epidemics and spreading processes Resilience and control Network visualization Social and political networks Networks in finance and economics Biological and ecological networks and Network analysis

## **Models With Heterogeneous Agents Introduction** Book Review: Unveiling the Magic of Language

In a digital era where connections and knowledge reign supreme, the enchanting power of language has become more apparent than ever. Its capability to stir emotions, provoke thought, and instigate transformation is actually remarkable. This extraordinary book, aptly titled "**Models With Heterogeneous Agents Introduction**," written by a highly acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound impact on our existence. Throughout this critique, we shall delve to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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