
Computational Approaches To Economic Problems

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*Computational
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Problems*

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AUDRINA REEVES

Computational

Economics Springer
Process Modelling and simulation have proved to be extremely successful engineering tools for the design and optimisation of physical, chemical and biochemical processes. The use of simulation has expanded rapidly over the last two decades because of the availability of large high-speed computers and indeed has become

even more widespread with the rise of the desktop PC resources now available to nearly every engineer and student. In the chemical industry large, realistic non-linear problems are routinely solved with the aid of computer simulation. This has a number of benefits, including easy assessment of the economic desirability of a project, convenient investigation of the effects of changes to system variables, and finally the introduction of mathematical rigour into

the design process and inherent assumptions that may not have been there before. Computational Methods for Process Simulation develops the methods needed for the simulation of real processes to be found in the process industries. It also stresses the engineering fundamentals used in developing process models. Steady state and dynamic systems are considered, for both spatially lumped and spatially distributed problems. It develops analytical and numerical

computational techniques for algebraic, ordinary and partial differential equations, and makes use of computer software routines that are widely available. Dedicated software examples are available via the internet. - Written for a compulsory course element in the US - Includes examples using software used in academia and industry - Software available via the Internet

High-Performance

Computing in Finance

Butterworth-Heinemann

This book presents recent

mathematical methods in the area of inverse problems in imaging with a particular focus on the computational aspects and applications. The formulation of inverse problems in imaging requires accurate mathematical modeling in order to preserve the significant features of the image. The book describes computational methods to efficiently address these problems based on new optimization algorithms for smooth and nonsmooth convex

minimization, on the use of structured (numerical) linear algebra, and on multilevel techniques. It also discusses various current and challenging applications in fields such as astronomy, microscopy, and biomedical imaging. The book is intended for researchers and advanced graduate students interested in inverse problems and imaging. *Computational Economics* Springer Science & Business Media
The Oxford Handbook of Computational Economics

and Finance provides a survey of both the foundations of and recent advances in the frontiers of analysis and action. It is both historically and interdisciplinarily rich and also tightly connected to the rise of digital society. It begins with the conventional view of computational economics, including recent algorithmic development in computing rational expectations, volatility, and general equilibrium. It then moves from traditional computing in economics and finance to

recent developments in natural computing, including applications of nature-inspired intelligence, genetic programming, swarm intelligence, and fuzzy logic. Also examined are recent developments of network and agent-based computing in economics. How these approaches are applied is examined in chapters on such subjects as trading robots and automated markets. The last part deals with the epistemology of simulation in its trinity form with the integration

of simulation, computation, and dynamics. Distinctive is the focus on natural computationalism and the examination of the implications of intelligent machines for the future of computational economics and finance. Not merely individual robots, but whole integrated systems are extending their "immigration" to the world of Homo sapiens, or symbiogenesis. *The Oxford Handbook of Computational Economics and Finance* MIT Press
Since the publication of

the first edition of *Network Economics: A Variational Inequality Approach* in 1993, there have been many advances in both methodological developments, as well as, applications in this field. These have occurred in an environment of an increasingly networked global economy, in which the importance of transportation networks and communication networks is now well-recognized, with networks such as knowledge networks, environmental

networks, and financial networks receiving growing attention. This edition adds recent research progress in new and evolving areas of network economics through common and unifying principles. In addition, it includes dynamic models of traffic, of spatially separated markets, of oligopolistic markets, and of financial markets. In order to expand the range and reach of this material, we have also included a series of problems in an appendix for self-study

purposes and for use in the classroom. We note that computational economics has been at the forefront in stimulating the development of mathematical methodologies for the analysis and solution of complex, large-scale problems. The past fifteen years, in particular, have witnessed a dramatic growth of interest in this area. Supported by the increasing availability of data and by advances in computer architectures, the scale and dimensions

of problems that can now be handled are unveiling new horizons in both theoretical modeling and policy analysis.

Programming Languages and Systems in Computational Economics and Finance

Vernon Press
Handbook of Computational Economics summarizes recent advances in economic thought, revealing some of the potential offered by modern computational methods. With computational power

increasing in hardware and algorithms, many economists are closing the gap between economic practice and the frontiers of computational mathematics. In their efforts to accelerate the incorporation of computational power into mainstream research, contributors to this volume update the improvements in algorithms that have sharpened econometric tools, solution methods for dynamic optimization and equilibrium models, and applications to public

finance, macroeconomics, and auctions. They also cover the switch to massive parallelism in the creation of more powerful computers, with advances in the development of high-power and high-throughput computing. Much more can be done to expand the value of computational modeling in economics. In conjunction with volume one (1996) and volume two (2006), this volume offers a remarkable picture of the recent development of economics as a science as

well as an exciting preview of its future potential. - Samples different styles and approaches, reflecting the breadth of computational economics as practiced today - Focuses on problems with few well-developed solutions in the literature of other disciplines - Emphasizes the potential for increasing the value of computational modeling in economics

Economic Dynamics, second edition CRC Press
Macroeconomics

increasingly uses stochastic dynamic general equilibrium models to understand theoretical and policy issues. Unless very strong assumptions are made, understanding the properties of particular models requires solving the model using a computer. This volume brings together leading contributors in the field who explain in detail how to implement the computational techniques needed to solve dynamic economics models. A broad spread of

techniques are covered, and their application in a wide range of subjects discussed. The book provides the basics of a toolkit which researchers and graduate students can use to solve and analyse their own theoretical models.

Network Economics

Springer

Economic Modeling Using Artificial Intelligence Methods examines the application of artificial intelligence methods to model economic data. Traditionally, economic modeling has been

modeled in the linear domain where the principles of superposition are valid. The application of artificial intelligence for economic modeling allows for a flexible multi-order non-linear modeling. In addition, game theory has largely been applied in economic modeling. However, the inherent limitation of game theory when dealing with many player games encourages the use of multi-agent systems for modeling economic phenomena. The artificial intelligence techniques used to model

economic data include: multi-layer perceptron neural networks radial basis functions support vector machines rough sets genetic algorithm particle swarm optimization simulated annealing multi-agent system incremental learning fuzzy networks Signal processing techniques are explored to analyze economic data, and these techniques are the time domain methods, time-frequency domain methods and fractals dimension approaches. Interesting economic

problems such as causality versus correlation, simulating the stock market, modeling and controlling inflation, option pricing, modeling economic growth as well as portfolio optimization are examined. The relationship between economic dependency and interstate conflict is explored, and knowledge on how economics is useful to foster peace – and vice versa – is investigated. Economic Modeling Using Artificial Intelligence Methods deals with the issue of

causality in the non-linear domain and applies the automatic relevance determination, the evidence framework, Bayesian approach and Granger causality to understand causality and correlation. Economic Modeling Using Artificial Intelligence Methods makes an important contribution to the area of econometrics, and is a valuable source of reference for graduate students, researchers and financial practitioners. Computational Economic Systems Princeton

University Press
A selection of 14 papers from a June 1994 meeting in Amsterdam illustrate the use of new computational methods and computing techniques to solve economic problems. The topics include investigating the evolution of behavior of economic agents, solving complex inventory models on a parallel computer, an original approach to constructing and solving multi-criteria models involving logical conditions, applying

wavelets to outlier detection, new estimation algorithms, and solving nonlinear rational expectation models. Reproduced from typescripts. Annotation copyright by Book News, Inc., Portland, OR
Handbook of Computational Econometrics Newnes Computational Methods and Production Engineering: Research and Development is an original book publishing refereed, high quality articles with a special emphasis on research and

development in production engineering and production organization for modern industry. Innovation and the relationship between computational methods and production engineering are presented. Contents include: Finite Element method (FEM) modeling/simulation; Artificial neural networks (ANNs); Genetic algorithms; Evolutionary computation; Fuzzy logic; neuro-fuzzy systems; Particle swarm optimization (PSO); Tabu

search and simulation annealing; and optimization techniques for complex systems. As computational methods currently have several applications, including modeling manufacturing processes, monitoring and control, parameters optimization and computer-aided process planning, this book is an ideal resource for practitioners. - Presents cutting-edge computational methods for production engineering - Explores the relationship between

applied computational methods and production engineering - Presents new innovations in the field - Edited by a key researcher in the field *Computational Methods for the Study of Dynamic Economies* MIT Press This monograph presents fundamental aspects of modern spectral and other computational methods, which are not generally taught in traditional courses. It emphasizes concepts as errors, convergence, stability, order and efficiency applied to the

solution of physical problems. The spectral methods consist in expanding the function to be calculated into a set of appropriate basis functions (generally orthogonal polynomials) and the respective expansion coefficients are obtained via collocation equations. The main advantage of these methods is that they simultaneously take into account all available information, rather than only the information available at a limited number of mesh points. They require

more complicated matrix equations than those obtained in finite difference methods. However, the elegance, speed, and accuracy of the spectral methods more than compensates for any such drawbacks. During the course of the monograph, the authors examine the usually rapid convergence of the spectral expansions and the improved accuracy that results when nonequispaced support points are used, in contrast to the equispaced points used in

finite difference methods. In particular, they demonstrate the enhanced accuracy obtained in the solution of integral equations. The monograph includes an informative introduction to old and new computational methods with numerous practical examples, while at the same time pointing out the errors that each of the available algorithms introduces into the specific solution. It is a valuable resource for undergraduate students as an introduction to the

field and for graduate students wishing to compare the available computational methods. In addition, the work develops the criteria required for students to select the most suitable method to solve the particular scientific problem that they are confronting.

Neuroeconomic and Behavioral Aspects of Decision Making IGI Global
 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.

Simulation in Computational Finance and Economics: Tools and Emerging Applications Springer Nature

The use of innovative computational models in political economic research as a complement

to traditional analytical methodologies.

Economic Modeling Using Artificial Intelligence Methods

University of Chicago Press

Optimal Transport Methods in Economics is the first textbook on the subject written especially for students and researchers in economics. Optimal transport theory is used widely to solve problems in mathematics and some areas of the sciences, but it can also be used to understand a range of problems in

applied economics, such as the matching between job seekers and jobs, the determinants of real estate prices, and the formation of matrimonial unions. This is the first text to develop clear applications of optimal transport to economic modeling, statistics, and econometrics. It covers the basic results of the theory as well as their relations to linear programming, network flow problems, convex analysis, and computational geometry. Emphasizing

computational methods, it also includes programming examples that provide details on implementation. Applications include discrete choice models, models of differential demand, and quantile-based statistical estimation methods, as well as asset pricing models. Authoritative and accessible, *Optimal Transport Methods in Economics* also features numerous exercises throughout that help you develop your mathematical agility,

deepen your computational skills, and strengthen your economic intuition. The first introduction to the subject written especially for economists Includes programming examples Features numerous exercises throughout Ideal for students and researchers alike [Computational Economic Systems](#) Springer Science & Business Media New and classical results in computational complexity, including interactive proofs, PCP, derandomization, and

quantum computation. Ideal for graduate students. **Computational and Decision Methods in Economics and Business** Academic Press Handbook of Computational Econometrics examines the state of the art of computational econometrics and provides exemplary studies dealing with computational issues arising from a wide spectrum of econometric fields including such topics as bootstrapping,

the evaluation of econometric software, and algorithms for control, optimization, and estimation. Each topic is fully introduced before proceeding to a more in-depth examination of the relevant methodologies and valuable illustrations. This book: Provides self-contained treatments of issues in computational econometrics with illustrations and invaluable bibliographies. Brings together contributions from leading researchers. Develops the techniques needed to

carry out computational econometrics. Features network studies, non-parametric estimation, optimization techniques, Bayesian estimation and inference, testing methods, time-series analysis, linear and nonlinear methods, VAR analysis, bootstrapping developments, signal extraction, software history and evaluation. This book will appeal to econometricians, financial statisticians, econometric researchers and students of econometrics at both graduate and advanced

undergraduate levels.

Computation and Big Data for Transport

Springer Science & Business Media

This book presents different topics related to innovation, complexity, uncertainty, modeling and simulation, fuzzy logic, decision-making, aggregation operators, business and economic applications, among others. The chapters are the results of research presented at the International Workshop "Innovation, Complexity and Uncertainty in

Economics and Business", held in Barcelona, in November 2019, by The Ibero-American Network for Competitiveness, Innovation and Development (REDCID in Spanish) and the Royal Academy of Economic and Financial Sciences (RACEF in Spanish). These papers are useful for junior and senior researchers in the area of economics and business.

Econometrics, Statistics, and Computational Approaches in Food and Health Sciences Springer Science & Business Media

The developments within the computationally and numerically oriented areas of Operations Research, Finance, Statistics and Economics have been significant over the past few decades. Each area has been developing its own computer systems and languages that suit its needs, but there is relatively little cross-fertilization among them yet. This volume contains a collection of papers that each highlights a particular system, language, model or

paradigm from one of the computational disciplines, aimed at researchers and practitioners from the other fields. The 15 papers cover a number of relevant topics: Models and Modelling in Operations Research and Economics, novel High-level and Object-Oriented approaches to programming, through advanced uses of Maple and MATLAB, and applications and solution of Differential Equations in Finance. It is hoped that the material in this volume will whet the

reader's appetite for discovering and exploring new approaches to old problems, and in the longer run facilitate cross-fertilization among the fields. We would like to thank the contributing authors, the reviewers, the publisher, and last, but not least, Jesper Saxtorph, Anders Nielsen, and Thomas Stidsen for invaluable technical assistance.

The Economics of Artificial Intelligence Springer
Science & Business Media
How to use nonlinear dynamic models in policy

analysis. Policymakers need quantitative as well as qualitative answers to pressing policy questions. Because of advances in computational methods, quantitative estimates are now derived from coherent nonlinear dynamic macroeconomic models embodying measures of risk and calibrated to capture specific characteristics of real-world situations. This text shows how such models can be made accessible and operational for confronting policy issues.

The book starts with a simple setting based on market-clearing price flexibility. It gradually incorporates departures from the simple competitive framework in the form of price and wage stickiness, taxes, rigidities in investment, financial frictions, and habit persistence in consumption. Most chapters end with computational exercises; the Matlab code for the base model can be found in the appendix. As the models evolve, readers are encouraged to modify

the codes from the first simple model to more complex extensions. Computational Macroeconomics for the Open Economy can be used by graduate students in economics and finance as well as policy-oriented researchers.

Computational Economics
World Scientific Publishing Company
The ability to conceptualize an economic problem verbally, to formulate it as a mathematical model, and then represent the

mathematics in software so that the model can be solved on a computer is a crucial skill for economists. Computational Economics contains well-known models--and some brand-new ones--designed to help students move from verbal to mathematical to computational representations in economic modeling. The authors' focus, however, is not just on solving the models, but also on developing the ability to modify them to reflect one's interest and point of

view. The result is a book that enables students to be creative in developing models that are relevant to the economic problems of their times. Unlike other computational economics textbooks, this book is organized around economic topics, among them macroeconomics, microeconomics, and finance. The authors employ various software systems--including MATLAB, Mathematica, GAMS, the nonlinear programming solver in Excel, and the database systems in Access--to

enable students to use the most advantageous system. The book progresses from relatively simple models to more complex ones, and includes appendices on the ins and outs of running each program. The book is intended for use by advanced undergraduates and professional economists and even, as a first exposure to computational economics, by graduate students. Organized by economic topics Progresses from simple to more complex

models Includes instructions on numerous software systems Encourages customization and creativity *Optimal Transport Methods in Economics* Springer Science & Business Media 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