Dynamic Programming In Economics

This book contains a concise description of important mathematical methods of dynamics and suitable economic models. It covers discrete as well as continuous-time systems, linear and nonlinear models. Mixing traditional and modern materials, the study covers dynamics with and without optimization, naive and rational expectations, respectively. In addition to standard models of growth and cycles, the book also contains original studies on control of a multisector economy and expectations-driven multicohort economy. Numerous examples, problems (with solutions) and figures complete the book.

Dynamic Programming in Economics is an outgrowth of a course intended for students in the first year PhD program and for researchers in Macroeconomics Dynamics. It can be used by students and researchers in Mathematics as well as in Economics. The purpose of Dynamic Programming in Economics is twofold: (a) to provide a rigorous, but not too complicated, treatment of optimal growth models in infinite discrete time horizon, (b) to train the reader to the use of optimal growth models and hence to help him to go further in his research. We are convinced that there is a place for a book which stays somewhere between the "minimum tool kit" and specialized monographs leading to the frontiers of research on optimal growth.

A rigorous and example-driven introduction to topics in economic dynamics, with an emphasis on mathematical and computational techniques for modeling dynamic systems. This text provides an introduction to the modern theory of economic dynamics, with emphasis on mathematical and computational techniques for modeling dynamic systems. Written to be both rigorous and engaging, the book shows how sound understanding of the underlying theory leads to effective algorithms for solving real world problems. The material makes extensive use of programming examples to illustrate ideas. These programs help bring to life the abstract concepts in the text. Background in computing and analysis is offered for readers without programming experience or upper-level mathematics. Topics covered in detail include nonlinear dynamic systems, finite-state Markov chains, stochastic dynamic programming, stochastic stability and computation of equilibria. The models are predominantly nonlinear, and the emphasis is on studying nonlinear systems in their original form, rather than by means of rudimentary approximation methods such as linearization. Much of the material is new to economics and improves on existing techniques. For graduate students and those already working in the field, Economic Dynamics will serve as an essential resource.

Optimal control theory is a technique being used increasingly by academic economists to study problems involving optimal decisions in a multi-period framework. This textbook is designed to make the difficult subject of optimal control theory easily accessible to economists while at the same time maintaining rigour. Economic intuitions are emphasized, and examples and problem sets covering a wide range of applications in economics are provided to assist in the learning process. Theorems are clearly stated and their proofs are carefully explained. The development of the text is gradual and fully integrated, beginning with simple formulations and progressing to advanced topics such as control parameters, jumps in state variables, and bounded state space. For greater economy and elegance, optimal control theory is introduced directly, without recourse to the calculus of variations. The connection with the latter and with dynamic programming is explained in a separate chapter. A second purpose of the book is to draw the parallel between optimal control theory and static optimization. Chapter 1 provides an extensive treatment of constrained and unconstrained maximization, with emphasis on economic insight and applications. Starting from basic concepts, it derives and explains important results, including the envelope theorem and the method of comparative statics. This chapter may be used for a course in static optimization. The book is largely self-contained. No previous knowledge of differential equations is required.

Variational Methods in Economics

The Infinite-horizon, Dynamic Programming Model of Economic Development

Mathematical Methods in Dynamic Economics

Optimization and Chaos

Comparative Statics in Dynamic Programming Models of Economics

Humans interact with and are part of the mysterious processes of nature. Inevitably they have to discover how to manage the environment for their long-term survival and benefit. To do this successfully means learning something about the dynamics of natural processes, and then using the knowledge to work with the forces of nature for some desired outcome. These are intriguing and challenging tasks. This book describes a technique which has much to offer in attempting to achieve the latter task. A knowledge of dynamic programming is useful for anyone interested in the optimal management of agricultural and natural resources for two reasons. First, resource management problems are often problems of dynamic optimization. The dynamic programming approach offers insights into the economics of dynamic optimization which can be explained much more simply than can other approaches. Conditions for the optimal management of a resource can be derived using the logic of dynamic programming, taking as a starting point the usual economic definition of the value of a resource which is optimally managed through time. This is set out in Chapter I for a general resource problem with the minimum of mathematics. The results are related to the discrete maximum principle of control theory. In subsequent chapters dynamic programming arguments are used to derive optimality conditions for particular resources.

Dynamic Programming is the analysis of multistage decision in the sequential mode. It is now widely recognized as a tool of great versatility and power, and is applied to an increasing extent in all phases of economic analysis, operations research, technology, and also in mathematical theory itself. In economics and operations research its impact may someday rival that of linear programming. The importance of this field is made apparent through a growing number of publications. Foremost among these is the pioneering work of Bellman. It was he who originated the basic ideas, formulated the principle of optimality, recognized its power, coined the terminology, and developed many of the present applications. Since then mathe maticians, statisticians, operations researchers, and economists have come in, laying more rigorous foundations [KARLIN, BLACKWELL], and developing in depth such application as to the control of stochastic processes [HoWARD, JEWELL]. The field of inventory control has almost split off as an independent branch of Dynamic Programming on which a great deal of effort has been expended [ARRoW, KARLIN, SCARF], [WIDTIN] , [WAGNER]. Dynamic Programming is also playing an in creasing role in modem mathematical control theory [BELLMAN, Adap tive Control Processes (1961)]. Some of the most exciting work is going on in adaptive programming which is closely related to sequential statistical analysis, particularly in its Bayesian form. In this monograph the reader is introduced to the basic ideas of Dynamic Programming.

The present work is an extended version of a manuscript of a course which the author taught at the University of Hamburg during summer 1969. The main purpose has been to give a rigorous foundation of stochastic dynamic programming in a manner which makes the theory easily applicable to many different practical problems. We mention the following features which should serve our purpose. a) The theory is built up for non-stationary models, thus making it possible to treat e.g. dynamic programming under risk, dynamic programming under uncertainty, Markovian models, stationary models, and models with finite horizon from a unified point of view. b) We use that notion of optimality (p-optimality) which seems to be most appropriate for practical purposes. c) Since we restrict ourselves to the foundations, we did not include practical problems and ways to their numerical solution, but we give (cf.section 8) a number of problems which show the diversity of structures accessible to non stationary dynamic programming. The main sources were the papers of Blackwell (65), Strauch (66) and Maitra (68) on stationary models with general state and action spaces and the papers of Dynkin (65), Hinderer (67) and Sirjaev (67) on non-stationary models. A number of results should be new, whereas most theorems constitute extensions (usually from stationary models to non-stationary models) or analogues to known results.

Some recent developments in the mathematics of optimization, including the concepts of invexity and quasimax, have not yet been applied to models of economic growth, and to finance and investment. Their applications to these areas are shown in this book.

Dynamic Economics

The Calculus of Variations and Optimal Control in Economics and Management

Mathematical Economics

Optimization in Economic Theory

Graduate-level text provides complete and rigorous expositions of economic models analyzed primarily from the point of view of their mathematical properties, followed by relevant mathematical reviews. Part I covers optimizing theory; Parts II and III survey static and dynamic economic models; and Part IV contains the mathematical reviews, which range fromn linear algebra to point-to-set mappings.

This work presents the optimization framework for dynamic economics and treats a number of topics in economics, including growth, macroeconomics, microeconomics, finance and dynamic games. The book also teaches by examples, using concepts to solve simple problems, moving on to general propositions.

Individuals and families make key decisions that impact many aspects of financial stability and determine the future of the economy. These decisions involve balancing current sacrifice against future benefits. People have to decide how much to invest in health care, exercise, their diet, and insurance. They must decide how much debt to take on, and how much to save. And they make choices about jobs that determine employment and unemployment levels. Forward-Looking Decision Making is about modeling this individual or family-based decision making using an optimizing dynamic programming model. Robert Hall first reviews ideas about dynamic programs and introduces new ideas about numerical solutions and the representation of solved models as Markov processes. He surveys recent research on the parameters of preferences--the intertemporal elasticity of substitution, the Frisch elasticity of labor supply, and the Frisch cross-elasticity. He then examines dynamic programming models applied to health spending, long-term care insurance, employment, entrepreneurial risk-taking, and consumer debt. Linking theory with data and applying them to real-world problems, Forward-Looking Decision Making uses dynamic optimization programming models to shed light on individual behaviors and their economic implications.

Advanced Textbooks in Economics, Volume 1: Variational Methods in Economics focuses on the application of variational methods in economics, including autonomous system, dynamic programming, and phase spaces and diagrams. The manuscript first elaborates on growth models in economics and calculus of variations. Discussions focus on connection with dynamic programming, variable end points-free boundaries, transversality at infinity, sensitivity analysis-end point changes, Weierstrass and Legendre necessary conditions, and phase diagrams and phase spaces. The text then ponders on the constraints of classical theory, including unbounded intervals of integration, free boundary conditions, comparison functions, normality, and the problem of Bolza. The publication explains two-sector models of optimal economic growth, optimal control theory, and connections with the classical theory. Topics include capital good immobile between industries, constrained state variables, linear control problems, conversion of a control problem into a problem of Lagrange, and the conversion of a nonautonomous system into an autonomous system. The book is a valuable source of information for economists and researchers interested in the variational methods in economics.

Dynamic Programming and Mathematical Economics

Dynamic Programming Solutions for Economic Models Requiring Little Information about the Future

Applied Dynamic Programming

Some Advances in Non-Linear, Dynamic, Multi-Criteria and Stochastic Models

Dynamic Economic Analysis

Stochastic Optimization Models in Finance focuses on the applications of stochastic optimization models in finance, with emphasis on results and methods that can and have been utilized in the analysis of real financial problems. The discussions are organized around five themes: mathematical tools; qualitative economic results; static portfolio selection models; dynamic models that are reducible to static models; and dynamic models. This volume consists of five parts and begins with an overview of expected utility theory, followed by an analysis of convexity and the Kuhn-Tucker conditions. The reader is then introduced to dynamic programming; stochastic dominance; and measures of risk aversion. Subsequent chapters deal with separation theorems; existence and diversification of optimal portfolio policies; effects of taxes on risk taking; and two-period consumption models and portfolio revision. The book also describes models of optimal capital accumulation and portfolio selection. This monograph will be of value to mathematicians and economists as well as to those interested in economic theory and mathematical economics.

In this text, Dr. Chiang introduces students to the most important methods of dynamic optimization used in economics. The classical calculus of variations, optimal control theory, and dynamic programming in its discrete form are explained in the usual Chiang fashion, with patience and thoroughness. The economic examples, selected from both classical and recent literature, serve not only to illustrate applications of the mathematical methods, but also to provide a useful glimpse of the development of thinking in several areas of economics.

"Christensen and Kiefer's excellent book shows how careful dynamic theory and econometrics go hand in hand, opening up new vistas in the areas of search theory, finance, and macroeconomics."--Tom Sargent, New York University and the Hoover Institution "There is no other book that mixes dynamic economic theory, statistical inference, and real quantitative applications like this one. Christensen and Kiefer will challenge the top tier of students and take them to the research frontier."--Robert Lucas, University of Chicago "Dynamic programming is an organizing framework that has enabled economists to integrate economic theory with empirical analysis. Few textbooks reflect the integrated nature of contemporary research, but Christensen and Kiefer reveal the power of the dynamic programming approach in a wide variety of applications from job search to portfolio choice. Their new book will be invaluable to students who wish to participate in this exciting enterprise."--John Y. Campbell, Harvard University "The authors do a splendid job of showing how to use stochastic dynamic optimization techniques to generate the implied distributions of observables needed for estimation. There are many interesting and useful examples included in the book, ranging from applications of the theory of job search to those of asset pricing theory. This book should be a reference for anyone interested in using dynamic economic models to make inferences about the world we observe."--Dale Mortensen, Aarhus University, Denmark, and Northwestern University "An extremely ambitious and thought-provoking book, one that combines state-of-the-art economic theory with sophisticated econometric techniques. The dynamic programming framework brings together important results and recent developments in a unique, unified way. The book is sure to inspire many PhD students and empirically oriented researchers for years to come."--Tim Bollerslev, Duke University "I have been looking for a book like this for quite a while. Economic Modeling and Inference is written for those who want to do applied work and actually apply this to real-life data or run simulations. This much-needed book fills a void. It is certainly a significant contribution to the field."--Yaw Nyarko, New York University "Economic Modeling and Inference blends economic theory and statistical inference in a seamless fashion. Every dynamic decision model is discussed with an eye for it to be fit with economic data. Every econometric inference tool is developed for the purpose of testing economic decision models. This book is long overdue. It will influence and benefit young economists for generations to come."--Mark Y. An, Fannie Mae

This work provides a unified and simple treatment of dynamic economics using dynamic optimization as the main theme, and the method of Lagrange multipliers to solve dynamic economic problems. The author presents the optimization framework for dynamic economics in order that readers can understand the approach and use it as they see fit. Instead of using dynamic programming, the author chooses instead to use the method of Lagrange multipliers in the analysis of dynamic optimization because it is easier and more efficient than dynamic programming, and allows readers to understand the substance of dynamic economics better. The author treats a number of topics in economics, including economic growth, macroeconomics, microeconomics, finance and dynamic games. The book also teaches by examples, using concepts to solve simple problems; it then moves to general propositions.

Foundations of Non-stationary Dynamic Programming with Discrete Time Parameter

Applications to Agriculture and Natural Resources

Dynamic Programming in Economics

Dynamic Programming and Its Application to Variational Problems in Mathematical Economics

Models and Applications

Elements of Numerical Mathematical Economics with Excel: Static and Dynamic Optimization shows readers how to apply static and dynamic optimization theory in an easy and practical manner, without requiring the mastery of specific programming languages that are often difficult and expensive to learn. Featuring user-friendly numerical discrete calculations developed within the Excel worksheets, the book includes key examples and economic applications solved step-by-step and then replicated in Excel. After introducing the fundamental tools of mathematical economics, the book explores the classical static optimization theory of linear and nonlinear programming, applying the core concepts of microeconomics and some portfolio theory. This provides a background for the more challenging worksheet applications of the dynamic optimization theory. The book also covers special complementary topics such as inventory modelling, data analysis for business and economics, and the essential elements of Monte Carlo analysis. Practical and accessible, Elements of Numerical Mathematical Economics with Excel: Static and Dynamic Optimization increases the computing power of economists worldwide. This book is accompanied by a companion website that includes Excel examples presented in the book, exercises, and other supplementary materials that will further assist in understanding this useful framework. Explains how Excel provides a practical numerical approach to optimization theory and analytics Increases access to the economic applications of this universally-available, relatively simple software program Encourages readers to go to the core of theoretical continuous calculations and learn more about optimization processes

An integrated approach to the empirical application of dynamic optimization programming models, for students and researchers. This book is an effective, concise text for students and researchers that combines the tools of dynamic programming with numerical techniques and simulation-based econometric methods. Doing so, it bridges the traditional gap between theoretical and empirical research and offers an integrated framework for studying applied problems in macroeconomics and microeconomics. In part I the authors first review the formal theory of dynamic optimization; they then present the numerical tools and econometric techniques necessary to evaluate the theoretical models. In language accessible to a reader with a limited background in econometrics, they explain most of the methods used in applied dynamic research today, from the estimation of probability in a coin flip to a complicated nonlinear stochastic structural model. These econometric techniques provide the final link between the dynamic programming problem and data. Part II is devoted to the application of dynamic programming to specific areas of applied economics, including the study of business cycles, consumption, and investment behavior. In each instance the authors present the specific optimization problem as a dynamic programming problem, characterize the optimal policy functions, estimate the parameters, and use models for policy evaluation. The original contribution of Dynamic Economics: Quantitative Methods and Applications lies in the integrated approach to the empirical application of dynamic optimization programming models. This integration shows that empirical applications actually complement the underlying theory of optimization, while dynamic programming problems provide needed structure for estimation and policy evaluation.

The purpose of this paper is to discuss some variational problems arising from mathematical economics, and some of the methods that can be used to treat these questions both analytically and computationally. The discussion is limited to important and interesting classes of processes, allocation and smoothing processes, and to a discussion of the application of the theory of dynamic programming to those processes. (Author).

Foundations of Dynamic Economic Analysis presents a modern and thorough exposition of the fundamental mathematical formalism used to study optimal control theory, i.e., continuous time dynamic economic processes, and to interpret dynamic economic behavior. The style of presentation, with its continual emphasis on the economic interpretation of mathematics and models, distinguishes it from several other excellent texts on the subject. This approach is aided dramatically by introducing the dynamic envelope theorem and the method of comparative dynamics early in the exposition. Accordingly, motivated and economically revealing proofs of the transversality conditions come about by use of the dynamic envelope theorem. Furthermore, such sequencing of the material naturally leads to the development of the primal-dual method of comparative dynamics and dynamic duality theory, two modern approaches used to tease out the empirical content of optimal control models. The stylistic approach ultimately draws attention to the empirical richness of optimal control theory, a feature missing in virtually all other textbooks of this type.

Numerical Methods in Economics

Optimal Control Theory and Static Optimization in Economics

Foundations of Dynamic Economic Analysis

Optimal Control Theory and Applications

Numerical Dynamic Programming in Economics

Since its initial publication, this text has defined courses in dynamic optimization taught to economics and management science students. The two-part treatment covers the calculus of variations and optimal control. 1998 edition.

To harness the full power of computer technology, economists need to use a broad range of mathematical techniques. In this book, Kenneth Judd presents techniques from the numerical analysis and applied mathematics literatures and shows how to use them in economic analyses. The book is divided into five parts. Part I provides a general introduction. Part II presents basics from numerical analysis on R^n, including linear equations, iterative methods, optimization, nonlinear equations, approximation methods, numerical integration and differentiation, and Monte Carlo methods. Part III covers methods for dynamic problems, including finite difference methods, projection methods, and numerical dynamic programming. Part IV covers perturbation and asymptotic solution methods. Finally, Part V covers applications to dynamic equilibrium analysis, including solution methods for perfect foresight models and rational expectation models. A website contains supplementary material including programs and answers to exercises.

Dynamic Programming in EconomicsSpringer Science & Business Media

Introduction to sequential decision processes covers use of dynamic programming in studying models of resource allocation, methods for approximating solutions of control problems in continuous time, production control, more. 1982 edition.

Dynamic Programming and Inverse Optimal Problems in Mathematical Economics

Dynamic Programming Models Applied to Health, Risk, Employment, and Financial Stability

Reinforcement Learning and Dynamic Programming Using Function Approximators

Optimization in Economics and Finance

Dynamic Macroeconomic Theory

The substantially revised fourth edition of a widely used text, offering both an introduction to recursive methods and advanced material, mixing tools and sample applications. Recursive methods provide powerful ways to pose and solve problems in dynamic macroeconomics. Recursive Macroeconomic Theory offers both an introduction to recursive methods and more advanced material. Only practice in solving diverse problems fully conveys the advantages of the recursive approach, so the book provides many applications. This fourth edition features two new chapters and substantial revisions to other chapters that demonstrate the power of recursive methods. One new chapter applies the recursive approach to Ramsey taxation and sharply characterizes the time inconsistency of optimal policies. These insights are used in other chapters to simplify recursive formulations of Ramsey plans and credible government policies. The second new chapter explores the mechanics of matching models and identifies a common channel through which productivity shocks are magnified across a variety of matching models. Other chapters have been extended and refined. For example, there is new material on heterogeneous beliefs in both complete and incomplete markets

models; and there is a deeper account of forces that shape aggregate labor supply elasticities in lifecycle models. The book is suitable for first- and second-year graduate courses in macroeconomics. Most chapters conclude with exercises; many exercises and examples use Matlab or Python computer programming languages.

This collection of essays brings together some articles on dynamic optimization models that exhibit chaotic behavior. Chapters 3, 4, 5, 6, 7, and 9 appeared in a Symposium on Chaotic Dynamical Systems in Economic Theory (Volume 4, Number 5, 1994). Also, Chapters 10,11, and 12 appeared in the Journal of Economic The ory. We would like to thank the authors, and Academic Press for permission to reprint. We are grateful to Professor C.D. Aliprantis for suggesting the idea of a book structured around the Economic Theory Symposium, and without the support and patience of Dr. Mueller this project could not have been completed. We would like to thank Ms. Amy Gowan who cheerfully per formed the arduous task of typing the manuscript. Thanks are also due to Xiao Qing Yu, Tridip Ray and Malabika Majumdar for their help at various stages in the preparation of the manuscript. For a course on dynamic optimization addressed to students with a good background in economic theory and real analysis, one can assign Chapter 2 as a partial introduction to the basic tech niques. Chapters 3 and 4 can be assigned to provide examples of simple optmization models generating complicated behavior.

This rigorous but brilliantly lucid book presents a self-contained treatment of modern economic dynamics. Stokey, Lucas, and Prescott develop the basic methods of recursive analysis and illustrate the many areas where they can usefully be applied.

This comprehensive study of dynamic programming applied to numerical solution of optimization problems. It will interest aerodynamic, control, and industrial engineers, numerical analysts, and computer specialists, applied mathematicians, economists, and operations and systems analysts. Originally published in 1962. The Princeton Legacy Library uses the latest print-on-demand technology to again make available previously out-of-print books from the distinguished backlist of Princeton University Press. These editions preserve the original texts of these important books while presenting them in durable paperback and hardcover editions. The goal of the Princeton Legacy Library is to vastly increase access to the rich scholarly heritage found in the thousands of books published by Princeton University Press since its founding in 1905.

Theory and Computation

Elements of Numerical Mathematical Economics with Excel

Applied Analysis

Dynamic Programming of Economic Decisions

Economic Dynamics

A new edition of a student text which provides a broad study of optimization methods. It builds on the base of simple economic theory, elementary linear algebra and calculus, and reinforces each new mathematical idea by relating it to its economic application.

This book provides an introduction to those parts of analysis that are most useful in applications for graduate students. The material is selected for use in applied problems, and is presented clearly and simply but without sacrificing mathematical rigor. The text is accessible to students from a wide variety of backgrounds, including undergraduate students entering applied mathematics from non-mathematical fields and graduate students in the sciences and engineering who want to learn analysis. A basic background in calculus, linear algebra and ordinary differential equations, as well as some familiarity with functions and sets, should be sufficient.

In industrial organization and labour economics, many of the most interesting recent contributions have encompassed explicit dynamics as well as extensive form games. This book collects and explains a number of the most widely used techniques in dynamic economic analysis.

From household appliances to applications in robotics, engineered systems involving complex dynamics can only be as effective as the algorithms that control them. While Dynamic Programming (DP) has provided researchers with a way to optimally solve decision and control problems involving complex dynamic systems, its practical value was limited by algorithms that lacked the capacity to scale up to realistic problems. However, in recent years, dramatic developments in Reinforcement Learning (RL), the model-free counterpart of DP, changed our understanding of what is possible. Those developments led to the creation of reliable methods that can be applied even when a mathematical model of the system is unavailable, allowing researchers to solve challenging control problems in engineering, as well as in a variety of other disciplines, including economics, medicine, and artificial intelligence. Reinforcement Learning and Dynamic Programming Using Function Approximators provides a comprehensive and unparalleled exploration of the field of RL and DP. With a focus on continuous-variable problems, this seminal text details essential developments that have substantially altered the field over the past decade. In its pages, pioneering experts provide a concise introduction to classical RL and DP, followed by an extensive presentation of the state-of-the-art and novel methods in RL and DP with approximation. Combining algorithm development with theoretical guarantees, they elaborate on their work with illustrative examples and insightful comparisons. Three individual chapters are dedicated to representative algorithms from each of the major classes of techniques: value iteration, policy iteration, and policy search. The features and performance of these algorithms are highlighted in extensive experimental studies on a range of control applications. The recent development of applications involving complex systems has led to a surge of interest in RL and DP methods and the subsequent need for a quality resource on the subject. For graduate students and others new to the field, this book offers a thorough introduction to both the basics and emerging methods. And for those researchers and practitioners working in the fields of optimal and adaptive control, machine learning, artificial intelligence, and operations research, this resource offers a combination of practical algorithms, theoretical analysis, and comprehensive examples that they will be able to adapt and apply to their own work. Access the authors' website at www.dcsc.tudelft.nl/rlbook/ for additional material, including computer code used in the studies and information concerning new developments.

Dynamic Programming

Recursive Methods in Economic Dynamics

Recursive Macroeconomic Theory, fourth edition

Dynamic Optimization, Second Edition

Quantitative Methods and Applications

One of the fundamental economic problems is one of making the best use of limited resources. As a result, mathematical optimisation methods play a crucial role in economic theory. Covering the use of such methods in applied and policy contexts, this book deals not only with the main techniques (linear programming, nonlinear optimisation and dynamic programming), but also emphasizes the art of model-building and discusses fields such as optimisation over time.

The tasks of macroeconomics are to interpret observations on economic aggregates in terms of the motivations and constraints of economic agents and to predict the consequences of alternative hypothetical ways of administering government economic policy. General equilibrium models form a convenient context for analyzing such alternative government policies. In the past ten years, the strengths of general equilibrium models and the corresponding deficiencies of Keynesian and monetarist models of the 1960s have induced macroeconomists to begin applying general equilibrium models. This book describes some general equilibrium models that are dynamic, that have been built to help interpret time-series of observations of economic aggregates and to predict the consequences of alternative government interventions. The first part of the book describes dynamic programming, search theory, and real dynamic capital pricing models. Among the applications are stochastic optimal growth models, matching models, arbitrage pricing theories, and theories of interest rates, stock prices, and options. The remaining parts of the book are devoted to issues in monetary theory; currency-in-utility-function models, cash-in-advance models, Townsend turnpike models, and overlapping generations models are all used to study a set of common issues. By putting these models to work on concrete problems in exercises offered throughout the text, Sargent provides insights into the strengths and weaknesses of these models of money. An appendix on functional analysis shows the unity that underlies the mathematics used in disparate areas of rational expectations economics. This book on dynamic equilibrium macroeconomics is suitable for graduate-level courses; a companion book, Exercises in Dynamic Macroeconomic Theory, provides answers to the exercises and is also available from Harvard University Press.

This book is a companion volume to Dynamic Macroeconomic Theory by Thomas J. Sargent. It provides scrimmages in dynamic macroeconomic theory--precisely the kind of drills that people will need in order to learn the techniques of dynamic programming and its applications to economics. By doing these exercises, the reader can acquire the ability to put the theory to work in a variety of new situations, build technical skill, gain experience in fruitful ways of setting up problems, and learn to distinguish cases in which problems are well posed from cases in which they are not.The basic framework provided by variants of a dynamic general equilibrium model is used to analyze problems in macroeconomics and monetary economics. An equilibrium model provides a mapping from parameters of preferences, technologies, endowments, and "rules of the game" to a probability model for time series. The rigor of the logical connections between theory and observations that the mapping provides is an attractive feature of dynamic equilibrium, or "rational expectations," models. This book gives repeated and varied practice in constructing and interpreting this mapping.

Static and Dynamic Optimization

Economic Modeling and Inference

Optimization by the Lagrange Method

Forward-Looking Decision Making

Optimisation in Economic Analysis