

Yoshio Murata

Optimal Control Methods for Linear Discrete-Time Economic Systems



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Optimal Control Methods For Linear Discrete Time Economic Systems

S. Osaki, Y. Hatoyama



Optimal Control Methods For Linear Discrete Time Economic Systems:

Optimal Control Methods for Linear Discrete-Time Economic Systems Y. Murata, 2012-12-06 As our title reveals we focus on optimal control methods and applications relevant to linear dynamic economic systems in discrete time variables We deal only with discrete cases simply because economic data are available in discrete forms hence realistic economic policies should be established in discrete time structures Though many books have been written on optimal control in engineering we see few on discrete type optimal control More over since economic models take slightly different forms than do engineering ones we need a comprehensive self contained treatment of linear optimal control applicable to discrete time economic systems The present work is intended to fill this need from the standpoint of contemporary macroeconomic stabilization The work is organized as follows In Chapter 1 we demonstrate instrument instability in an economic stabilization problem and thereby establish the motivation for our departure into the optimal control world Chapter 2 provides fundamental concepts and propositions for controlling linear deterministic discrete time systems together with some economic applications and numerical methods Our optimal control rules are in the form of feedback from known state variables of the preceding period When state variables are not observable or are accessible only with observation errors we must obtain appropriate proxies for these variables which are called observers in deterministic cases or filters in stochastic circumstances In Chapters 3 and 4 respectively Luenberger observers and Kalman filters are discussed developed and applied in various directions Noticing that a separation principle lies between observer or filter and controller cf *Control Theory Methods in Economics* Jati Sengupta, Phillip Fanchon, 2012-12-06 Control theory methods in economics have historically developed over three phases The first involved basically the feedback control rules in a deterministic framework which were applied in macrodynamic models for analyzing stabilization policies The second phase raised the issues of various types of inconsistencies in deterministic optimal control models due to changing information and other aspects of stochasticity Rational expectations models have been extensively used in this plan to resolve some of the inconsistency problems The third phase has recently focused on the various aspects of adaptive control where stochasticity and information adaptivity are introduced in diverse ways e g risk adjustment and risk sensitivity of optimal control recursive updating rules via Kalman filtering and weighted recursive least squares and variable structure control methods in nonlinear framework Problems of efficient econometric estimation of optimal control models have now acquired significant importance This monograph provides an integrated view of control theory methods synthesizing the three phases from feedback control to stochastic control and from stochastic control to adaptive control Aspects of econometric estimation are strongly emphasized here since these are very important in empirical applications in economics

Optimal Control Methods for Linear Discrete-time Economic Systems Yasuo Murata, 1982 As our title reveals we focus on optimal control methods and applications relevant to linear dynamic economic systems in discrete time variables We deal only with discrete cases simply

because economic data are available in discrete forms hence realistic economic policies should be established in discrete time structures Though many books have been written on optimal control in engineering we see few on discrete type optimal control More over since economic models take slightly different forms than do engineering ones we need a comprehensive self contained treatment of linear optimal control applicable to discrete time economic systems The present work is intended to fill this need from the standpoint of contemporary macroeconomic stabilization The work is organized as follows In Chapter 1 we demonstrate instrument instability in an economic stabilization problem and thereby establish the motivation for our departure into the optimal control world Chapter 2 provides fundamental concepts and propositions for controlling linear deterministic discrete time systems together with some economic applications and numerical methods Our optimal control rules are in the form of feedback from known state variables of the preceding period When state variables are not observable or are accessible only with observation errors we must obtain appropriate proxies for these variables which are called observers in deterministic cases or filters in stochastic circumstances In Chapters 3 and 4 respectively Luenberger observers and Kalman filters are discussed developed and applied in various directions Noticing that a separation principle lies between observer or filter and controller cf **Optimal Control Theory** Suresh P. Sethi, 2018-11-28 This fully revised 3rd edition offers an introduction to optimal control theory and its diverse applications in management science and economics It brings to students the concept of the maximum principle in continuous as well as discrete time by using dynamic programming and Kuhn Tucker theory While some mathematical background is needed the emphasis of the book is not on mathematical rigor but on modeling realistic situations faced in business and economics The book exploits optimal control theory to the functional areas of management including finance production and marketing and to economics of growth and of natural resources In addition this new edition features materials on stochastic Nash and Stackelberg differential games and an adverse selection model in the principal agent framework The book provides exercises for each chapter and answers to selected exercises to help deepen the understanding of the material presented Also included are appendices comprised of supplementary material on the solution of differential equations the calculus of variations and its relationships to the maximum principle and special topics including the Kalman filter certainty equivalence singular control a global saddle point theorem Sethi Skiba points and distributed parameter systems Optimal control methods are used to determine optimal ways to control a dynamic system The theoretical work in this field serves as a foundation for the book which the author has applied to business management problems developed from his research and classroom instruction The new edition has been completely refined and brought up to date Ultimately this should continue to be a valuable resource for graduate courses on applied optimal control theory but also for financial and industrial engineers economists and operational researchers concerned with the application of dynamic optimization in their fields *Bayesian Full Information Analysis of Simultaneous Equation Models Using Integration by Monte Carlo* L. Bauwens, 2012-12-06 In their review of the Bayesian

analysis of simultaneous equation systems Dr Ze and Richard 1983 hereafter DR express the following viewpoint about the present state of development of the Bayesian full information analysis of such systems i the method allows a flexible specification of the prior density including well defined noninformative prior measures ii it yields exact finite sample posterior and predictive densities However they call for further developments so that these densities can be evaluated through numerical methods using an integrated software package To that end they recommend the use of a Monte Carlo technique since van Dijk and Kloek 1980 have demonstrated that the integrations can be done and how they are done In this monograph we explain how we contribute to achieve the developments suggested by Dr Ze and Richard A basic idea is to use known properties of the posterior density of the parameters of the structural form to design the importance functions i.e. approximations of the posterior density that are needed for organizing the integrations

A Disequilibrium Model of Real and Financial Accumulation in an Open Economy Giancarlo Gandolfo, Pietro C. Padoan, 2012-12-06 This is the fourth version of a model that five years ago we set out to build and estimate along the lines of the continuous time approach clarified In chapter 1 Previous versions appeared in journal articles and conference proceedings where the space is notoriously limited Therefore we welcome the possibility of publishing a book length treatment of this fourth version so that we can describe its theoretical and empirical aspects in some detail Although we have worked closely together and accept joint responsibility for the whole book chs 1 and 2 and appendix I have been written by G Gandolfo whilst chs 3 and 4 and appendix II have been written by P C Padoan Different parts of this version of the model have been discussed In various lectures at the European University Institute Florence in 1984 In a seminar organized by the Bank of Italy Sadiba Perugia Italy February 16 18 1984 in the second Viennese Workshop on Economic Applications of Control Theory Vienna May 16 18 1984 and in the sixth annual Conference of the Society for Economic Dynamics and Control Nice France June 13 15 1984 In all of these we received helpful comments similarly helpful were the comments of Clifford R Wymer who however is absolved of any responsibility

Dynamic Modelling and Control of National Economies 1989 N.M. Christodoulakis, 2014-06-28 The Symposium aimed at analysing and solving the various problems of representation and analysis of decision making in economic systems starting from the level of the individual firm and ending up with the complexities of international policy coordination The papers are grouped into subject areas such as game theory control methods international policy coordination and the applications of artificial intelligence and experts systems as a framework in economic modelling and control The Symposium therefore provides a wide range of important information for those involved or interested in the planning of company and national economics

The M/M/∞ Service System with Ranked Servers in Heavy Traffic G.F. Newell, 2012-12-06 We are concerned here with a service facility consisting of a large finite number of servers in parallel The service times for all servers are identical but there is a preferential ordering of the servers Each newly arriving customer enters the lowest ranked available server and remains there until his service is completed It is assumed that customers arrive

according to a Poisson process of rate A that all servers have exponentially distributed service times with rate A and that A is large compared with 1. Generally we are concerned with the stochastic properties of the random function $N_s(t)$ describing the number of busy servers among the first s ordered servers at time t . Most of the analysis is motivated by special applications of this model to telephone traffic. If one has a trunk line with s primary channels but a large number ∞ of secondary overflow channels each newly arriving customer is assigned to one of the primary channels if any are free otherwise he is assigned to a secondary channel. The primary and secondary channels themselves could have a preferential ordering. For some purposes it is convenient to imagine that they did even if an ordering is irrelevant.

Control Theory and Dynamic Games in Economic Policy Analysis Maria Luisa Petit, 1990. This book deals with the stabilisation and control of centralised policy making and its economic implications. **Stochastic Models in Reliability Theory** S. Osaki, Y. Hatoyama, 2013-03-08 **Advanced**

Econometric Methods Thomas B. Fomby, R. Carter Hill, Stanley R. Johnson, 2012-12-06. This book had its conception in 1975 in a friendly tavern near the School of Business and Public Administration at the University of Missouri Columbia. Two of the authors Fomby and Hill were graduate students of the third Johnson and were and are concerned about teaching econometrics effectively at the graduate level. We decided then to write a book to serve as a comprehensive text for graduate econometrics. Generally the material included in the book and its organization have been governed by the question: How could the subject be best presented in a graduate class? For content this has meant that we have tried to cover all the bases and yet have not attempted to be encyclopedic. The intended purpose has also affected the level of mathematical rigor. We have tended to prove only those results that are basic and/or relatively straightforward. Proofs that would demand inordinant amounts of class time have simply been referenced. The book is intended for a two semester course and paced to admit more extensive treatment of areas of specific interest to the instructor and students. We have great confidence in the ability, industry and persistence of graduate students in ferreting out and understanding the omitted proofs and results. In the end this is how one gains maturity and a fuller appreciation for the subject in any case. It is assumed that the readers of the book will have had an econometric methods course using texts like J. Johnston's *Econometric Methods* 2nd ed. **Developments of Control**

Theory for Economic Analysis Carlo Carraro, D. Sartore, 2012-12-06. Giovanni Castellani Rector of the University of Venice. This book contains the Proceedings of the Conference on Economic Policy and Control Theory which was held at the University of Venice Italy on 27 January - 1 February 1985. The goal of the Conference was to survey the main developments of control theory in economics by emphasizing particularly new achievements in the analysis of dynamic economic models by control methods. The development of control theory is strictly related to the development of science and technology in the last forty years. Control theory was indeed applied mainly in engineering and only in the sixties economists started using control methods for analysing economic problems even if some preliminary economic applications of calculus of variations from which control theory was then developed date back to the twenties. Applications of control theory in economics also had

to solve new complicated problems like those encountered in optimal growth models or like the determination of the appropriate inter temporal social welfare function of the policy horizon and the relative final state of the system of the appropriate discount factor Furthermore the uncertainty characterizing economic models had to be taken into account thus giving rise to the development of stochastic control theory in economics

Macro-Economic Planning with Conflicting Goals M. Despontin, P. Nijkamp, J. Spronk, 2012-12-06

Interactive Decision Analysis M. Grauer, A.P. Wierzbicki, 2013-03-14

During the week of September 20-23 1983 an International Workshop on Interactive Decision Analysis and Interpretative Computer Intelligence was held at the International Institute for Applied Systems Analysis IIASA in Laxenburg Austria More than fifty scientists representing seventeen countries participated The aim of the Workshop was to review existing approaches to problems involving multiple conflicting objectives to look at methods and techniques for interactive decision analysis and to demonstrate the use of existing interactive decision support systems The Workshop was motivated firstly by the realization that the rapid development of computers especially microcomputers will greatly increase the scope and capabilities of computerized decision support systems It is important to explore the potential of these systems for use in handling the complex technological environmental economic and social problems that face the world today Research in decision support systems also has another less tangible but possibly more important motivation The development of efficient systems for decision support requires a thorough understanding of the differences between the decision making processes in different nations and cultures An understanding of the different rationales underlying decision making is not only necessary for the development of efficient decision support systems but is also an important factor in encouraging international understanding and cooperation

Nonlinear Models of Fluctuating Growth R.M. Goodwin, M. Krüger, A. Vercelli, 2012-12-06

Misspecification Analysis Theo K. Dijkstra, 2012-12-06

Control and Dynamic Systems V22 C.T. Leonides, 2012-12-02

Control and Dynamic Systems Volume 22 Decentralized Distributed Control and Dynamic Systems Part 1 deals with advances in techniques for the analysis and synthesis of decentralized or distributed control and dynamic systems This book begins with a unique presentation of important results and techniques that decentralized control systems often face due to the fact that the individual systems in a collection or set of decentralized control systems are somewhat incomplete The controllability observability implications and powerful techniques for stabilization and control of decentralized systems are also discussed The next chapters describe the covariance equivalent realizations with application to model reductions of large scale systems and decentralized estimation and control of one way connected subsystems This publication concludes with a presentation of the multivariable feedback and decentralized control that reviews fundamental results extending multivariable theory from conventional control systems to the highly challenging problems of decentralized control This volume is beneficial to students and researchers conducting work on decentralized or distributed control and dynamic systems

Control and Dynamic Systems V17 C.T. Leonides, 2012-12-02

Control and Dynamic Systems Advances in

Theory and Application Volume 17 deals with the theory of differential games and its applications. It provides a unique presentation of the differential game theory as well as the use of algorithms for solving this complex class problems. This book discusses fundamental concepts and system problem formulation for differential game systems. It also considers pursuit evasion games and on line real time computer control techniques. This book will serve as a useful reference for those interested in effective computations for differential games. *Control and Dynamic Systems V16* C.T. Leonides, 2012-12-02

Control and Dynamic Systems Advances in Theory and Application Volume 16 is concerned with applied dynamic systems control techniques. It describes various techniques for system modeling which apply to several systems issues. This book presents a comprehensive treatment of powerful algorithmic techniques for solving dynamic system optimization problems. It also describes approaches for systems model that apply to system issues such as time delays. The remaining chapters of this book explore the simulation of large closed loop systems and optimization of low order feedback controllers for discrete time systems. Researchers who wish to broaden their understanding of dynamic systems control techniques will find this book invaluable. **Control and Dynamic Systems V19** C.T. Leonides, 2012-12-02

Volume 19 Nonlinear and Kalman Filtering Techniques Part 1 of 3 covers the advances in the techniques and technology of nonlinear filters and Kalman filters. The book provides a comprehensive treatment of the theory and applications of nonlinear filters and Kalman filters. Chapters are devoted to the discussion of the exact and approximate state estimation techniques for nonlinear dynamic systems, computational efficiencies in the various approaches to filtering techniques, the implementation of filters by the use of microprocessors and distributed processor systems and practical means for dealing with nonlinearities. Engineers, economists, seismologists, meteorologists and communications experts will find this book a good reference material.

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Optimal Control Methods For Linear Discrete Time Economic Systems Introduction

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