Research Article

A Dynamic Economic Model with Discrete Time and Consumer Sentiment

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The paper describes a dynamical economic model with discrete time and consumer sentiment in the deterministic and stochastic cases. We seek to demonstrate that consumer sentiment may create fluctuations in the economical activities. The model possesses a flip bifurcation and a Neimark-Sacker bifurcation, after which the stable state is replaced by a (quasi) periodic motion. We associate the difference stochastic equation to the model by randomizing the control parameter d and by adding one stochastic control. Numerical simulations are made for the deterministic and stochastic models, for different values of the control parameter d.

1. Introduction

The economic empirical evidence [1–3] suggests that consumer sentiment influences household expenditure and thus confirms Keynes' assumption that consumer "attitudes" and "animalic spirit" may cause fluctuations in the economic activity. On the other hand, Dobrescu and Opris [4, 5] analyzed the bifurcation aspects in a discrete-delay Kaldor model of business cycle, which corresponds to a system of equations with discrete time and delay. Following these studies, we develop a dynamic economic model in which the agents' consumption expenditures depend on their sentiment. As particular cases, the model contains the Hick-Samulson [6], Puu [7], and Keynes [3] models as well as the model from [3]. The model possesses a flip and Neimark-Sacker bifurcation, if the autonomous consumption is variable.

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Performance and Constraint Satisfaction in Robust Economic Model Predictive Control Florian A. Bayer ,2017 In this thesis we develop a novel framework for model predictive control MPC which combines the concepts of robust MPC and economic MPC The goal of this thesis is to develop and analyze MPC schemes for nonlinear discrete time systems which explicitly consider the influence of disturbances on arbitrary performance criteria Instead of regarding the two aspects separately we propose robust economic MPC approaches that integrate information which is available about the disturbance directly into the economic framework In more detail we develop three concepts which differ in which information about the disturbance is used and how this information is taken into account Furthermore we provide a thorough theoretical analysis for each of the three approaches To this end we present results on the asymptotic average performance as well as on optimal operating regimes Optimal operating regimes are closely related to the notion of dissipativity which is therefore analyzed for the presented concepts Under suitable assumptions results on necessity and sufficiency of dissipativity for optimal steady state operation are established for all three robust economic MPC concepts A detailed discussion is provided which compares the different performance statements derived for the approaches as well as the respective notions of dissipativity

Advances in Computational Collective Intelligence Marcin Hernes,Krystian Wojtkiewicz,Edward Szczerbicki,2020-11-20 This book constitutes refereed proceedings of the 12th International Conference on International Conference on Computational Collective Intelligence ICCCI 2020 held in Da Nang Vietnam in November December 2020 Due to the the COVID 19 pandemic the conference was held online The 68 papers were thoroughly reviewed and selected from 314 submissions The papers are organized according to the following topical sections data mining and machine learning deep learning and applications for industry 4 0 recommender systems computer vision techniques decision support and control systems intelligent management information systems innovations in intelligent systems intelligent modeling and simulation approaches for games and real world systems experience enhanced intelligence to IoT data driven IoT for smart society applications of collective intelligence natural language processing low resource languages processing computational collective intelligence and natural language processing   **Mathematical Economics** Vasily E. Tarasov,2020-06-03 This book is devoted to the application of fractional calculus in economics to describe processes with memory and non locality Fractional calculus is a branch of mathematics that studies the properties of differential and integral operators that are characterized by real or complex orders Fractional calculus methods are powerful tools for describing the processes and systems with memory and nonlocality Recently fractional integro differential equations have been used to describe a wide class of economical processes with power law memory and spatial nonlocality Generalizations of basic economic concepts and notions the economic processes with memory were proposed New mathematical models with continuous time are proposed to describe economic dynamics with long memory This book is a collection of articles reflecting the latest

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everywhere Introducing discrete time modelling techniques and bridging the gap between economics and econometric literature this ambitious book is sure to be an invaluable resource for all those to whom the terms unit roots cointegration and error correction forms chaos theory and random walks are recognisable if not yet fully understood *Economic Dynamics in Discrete Time* Jianjun Miao,2014-09-12 A unified comprehensive and up to date introduction to the analytical and numerical tools for solving dynamic economic problems This book offers a unified comprehensive and up to date treatment of analytical and numerical tools for solving dynamic economic problems The focus is on introducing recursive methods an important part of every economist s set of tools and readers will learn to apply recursive methods to a variety of dynamic economic problems The book is notable for its combination of theoretical foundations and numerical methods Each topic is first described in theoretical terms with explicit definitions and rigorous proofs numerical methods and computer codes to implement these methods follow Drawing on the latest research the book covers such cutting edge topics as asset price bubbles recursive utility robust control policy analysis in dynamic New Keynesian models with the zero lower bound on interest rates and Bayesian estimation of dynamic stochastic general equilibrium DSGE models The book first introduces the theory of dynamical systems and numerical methods for solving dynamical systems and then discusses the theory and applications of dynamic optimization The book goes on to treat equilibrium analysis covering a variety of core macroeconomic models and such additional topics as recursive utility increasingly used in finance and macroeconomics dynamic games and recursive contracts The book introduces Dynare a widely used software platform for handling a range of economic models readers will learn to use Dynare for numerically solving DSGE models and performing Bayesian estimation of DSGE models Mathematical appendixes present all the necessary mathematical concepts and results Matlab codes used to solve examples are indexed and downloadable from the book s website A solutions manual for students is available for sale from the MIT Press a downloadable instructor s manual is available to qualified instructors *ECONOMICS LETTERS* ,1999 Dynamic Economic Analysis Gerhard Sorger,2015-02-12 Concise yet rigorous this textbook provides a clear and systematic introduction to the theory and application of dynamic economic models **SIAM Journal on Control and Optimization** Society for Industrial and Applied Mathematics,2008 *Journal of Agricultural and Resource Economics* ,2008 *International Aerospace Abstracts* ,1992 *Canadian Journal of Fisheries and Aquatic Sciences* ,2012-10 **Dynamics of Continuous Time and Related Discrete Time Economic Models** Herman J. Nieuwenhuis,Lambert Schoonbeek,1992 **Footnotes** ,2004 **Introduction to Dynamic Economic Models** Brian S. Ferguson,Guay C. Lim,1998 Unnecessary complexity has been avoided yet the models have been presented in the same general form as they appear in the professional literature **Smoothness of the Policy Function in Discrete Time Economic Models** Manuel Simas Santos,1990 **Set Valued Dynamical Systems and Economic Flow** Louis J. Cherene,1978 The purpose of this monograph is to illuminate the central issues of dynamic analysis applied to economic models using a generally accepted

language of the study of dynamical systems at a level of sophistication likely to be understood by an economist versed in elementary topology Whether an economic system is governed by a first order difference equation or several simultaneous multivalued partial differential equations its solution is a flow that determines the state of the system given an initial condition and elapsed time Thus the flow of a system is the central concept from which the theory here expounded develops The explicit examples and applications herein are discrete time models but the theoretical re sults hold for continuous time models as well The supplementary bibliography in cludes several papers at the frontier of set valued dynamics which may be viewed using the basic concepts defined in this text all of these works involve demon strating that almost all possible trajectories that a system may follow converge to some set of equilibria The application of set valued dynamical analysis to economic models is pro vided to engender in the reader an appreciation for the relevance of these con cepts to economic theory

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