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MODELING MULTIVARIATE NONSTATIONARY TIME SERIES OF ECONOMIC DYNAMICS BASED ON FOKKER-PLANCK EQUATION

The subject of economic dynamics is a simulation of behavior of economic systems under the influence of internal and external factors in order to analyze balance, control and prediction of the evolution of economic systems. Mathematical models of economic dynamics are the formal reflection of the many economic scenarios development. This is usually determined models which are based on some economic concepts. Under the economic dynamics also understand the dynamic series - series of numbers that characterize the change of the social or economic event that is economic time series (ETS) [1]. Really researched ETS - nonstationary and almost always multi sign nature, their reliable reflection in the economic - mathematical models is possible only on condition taking into account the complex inherent features of the most significant characteristics. Currently, the development of mathematical methods for the analysis of nonstationary multivariate processes has great practical importance and demand in the economy. This is due to the need to improve the accuracy of predictions and, in particular, the price indicators of financial and commodity markets.

Modern economics has in its arsenal a large number of methods for analyzing ETS and predicting socio - economic indicators: statistical [2], determined [3], econophysics methods, phase analysis, wavelet - analysis, spectral analysis [4-7], adaptive forecasting methods - neural networks, genetic algorithms, group method of data handling, method "caterpillar" [8,9]. Most of these approaches are used only for one-dimensional and stationary ETS. Constructing a statistically correct economic - mathematical models of multivariate nonstationary ETS and methods of analysis is an actual problem. The theoretical basis of these models is a multi-dimensional Fokker - Planck equation [10,11]. The purpose of this study is to develop mathematical models of nonstationary multi ETS for their analysis, forecasting and decision-making in financial and commodity markets on the basis of the author's concept of multivariate modeling of dynamic systems [12].

1. The relationship between the continuity equation and the Fokker - Planck equation, Dynamic System (DS) is characterized by state variables $\mathbf{x} = \{x_1, x_2, \dots, x_n\}$ - system of economic performance and function of the state $\phi(\mathbf{x}) = \phi(x_1, x_2, \dots, x_n)$ - probability density function (PDF), considered in the phase space Γ points \mathbf{x} . Measure $d\Gamma_n = \phi(x_1, x_2, \dots, x_n) \prod_{i=1}^n dx_i$ is the number of states ETS of specified intervals dx_i .

State variables are standardize:

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Modelling Non-Stationary Economic Time Series S. Burke, J. Hunter, 2005-06-14 Co integration equilibrium and equilibrium correction are key concepts in modern applications of econometrics to real world problems This book provides direction and guidance to the now vast literature facing students and graduate economists Econometric theory is linked to practical issues such as how to identify equilibrium relationships how to deal with structural breaks associated with regime changes and what to do when variables are of different orders of integration Multivariate Modelling of Non-Stationary Economic Time Series John Hunter, Simon P. Burke, Alessandra Canepa, 2017-05-08 This book examines conventional time series in the context of stationary data prior to a discussion of cointegration with a focus on multivariate models The authors provide a detailed and extensive study of impulse responses and forecasting in the stationary and non stationary context considering small sample correction volatility and the impact of different orders of integration Models with expectations are considered along with alternate methods such as Singular Spectrum Analysis SSA the Kalman Filter and Structural Time Series all in relation to cointegration Using single equations methods to develop topics and as examples of the notion of cointegration Burke Hunter and Canepa provide direction and guidance to the now vast literature facing students and graduate economists

Modelling Non-stationary Economic Time Series Simon P. Burke, 2005 *The SIML Filtering Method for Noisy Non-stationary Economic Time Series* Naoto Kunitomo, Seisho Sato, 2025-03-03 In this book we explain the development of a new filtering method to estimate the hidden states of random variables for multiple non stationary time series data This method is particularly helpful in analyzing small sample non stationary macro economic time series The method is based on the frequency domain application of the separating information maximum likelihood SIML method which was proposed by Kunitomo Sato and Kurisu Springer 2018 for financial high frequency time series We solve the filtering problem of hidden random variables of trend cycle seasonal and measurement error components and propose a method to handle macro economic time series The asymptotic theory based on the frequency domain analysis for non stationary time series is developed with illustrative applications including properties of the method of Muller and Watson 2018 and analyses of macro economic data in Japan Vast research has been carried out on the use of statistical time series analysis for macro economic time series One important feature of the series which is different from standard statistical time series analysis is that the observed time series is an apparent mixture of non stationary and stationary components We apply the SIML method for estimating the non stationary errors in variables models As well we discuss the asymptotic and finite sample properties of the estimation of unknown parameters in the statistical models Finally we utilize their results to solve the filtering problem of hidden random variables and to show that they lead to new a way to handle macro economic time series

Modelling Trends and Cycles in Economic Time Series Terence C. Mills, 2021-07-29 Modelling trends and cycles in economic time series has a long history with the use of linear trends and moving averages forming the basic tool kit of economists until the 1970s

Several developments in econometrics then led to an overhaul of the techniques used to extract trends and cycles from time series In this second edition Terence Mills expands on the research in the area of trends and cycles over the last almost two decades to highlight to students and researchers the variety of techniques and the considerations that underpin their choice for modelling trends and cycles

Uncertainty Modeling In Knowledge Engineering And Decision Making - Proceedings Of The 10th International Flins Conference Cengiz Kahraman,Faik Tunc Bozbura,Etienne E Kerre,2012-08-10 FLINS originally an acronym for Fuzzy Logic and Intelligent Technologies in Nuclear Science is now extended to Computational Intelligence for applied research The contributions to the 10th of FLINS conference cover state of the art research development and technology for computational intelligence systems both from the foundations and the applications points of view

A Companion to Theoretical Econometrics Badi H. Baltagi,2008-04-15 A Companion to Theoretical Econometrics provides a comprehensive reference to the basics of econometrics This companion focuses on the foundations of the field and at the same time integrates popular topics often encountered by practitioners The chapters are written by international experts and provide up to date research in areas not usually covered by standard econometric texts Focuses on the foundations of econometrics Integrates real world topics encountered by professionals and practitioners Draws on up to date research in areas not covered by standard econometrics texts Organized to provide clear accessible information and point to further readings

Global Approaches in Financial Economics, Banking, and Finance Hasan Dincer,Ümit Hacıoglu,Serhat Yüksel,2018-06-12 This volume discusses the impact of Financial Economics Growth Dynamics and the Finance Banking sector in the economies of countries The contributors analyse and discuss the effects of the recent financial crises on the economic growth and performance in various countries The volume covers aspects like foreign borrowing impact on productivity and debt crises that are strongly affected by the financial volatility of recent years and includes examples from Europe and Asia In addition the authors give particular attention to the private sector of Finance and Banking which is deeply interwoven with the financial performance of a country s economy Examples such as bank profitability and troubled loans are covered and the volume also discusses the economic impact of banks such as the Ottoman Bank in a national economy The book also explores the importance of financial stability intellectual capital and bank performance for a stable economic environment

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Beyond Traditional Probabilistic Methods in Economics Vladik Kreinovich,Nguyen Ngoc Thach,Nguyen Duc Trung,Dang Van

Thanh,2018-11-24 This book presents recent research on probabilistic methods in economics from machine learning to statistical analysis Economics is a very important and at the same a very difficult discipline It is not easy to predict how an economy will evolve or to identify the measures needed to make an economy prosper One of the main reasons for this is the high level of uncertainty different difficult to predict events can influence the future economic behavior To make good predictions and reasonable recommendations this uncertainty has to be taken into account In the past most related research results were based on using traditional techniques from probability and statistics such as p value based hypothesis testing These techniques led to numerous successful applications but in the last decades several examples have emerged showing that these techniques often lead to unreliable and inaccurate predictions It is therefore necessary to come up with new techniques for processing the corresponding uncertainty that go beyond the traditional probabilistic techniques This book focuses on such techniques their economic applications and the remaining challenges presenting both related theoretical developments and their practical applications

The Oxford Handbook of Applied Nonparametric and Semiparametric Econometrics and Statistics Jeffrey Racine,Liangjun Su,Aman Ullah,2013-12-31 This volume edited by Jeffrey Racine Liangjun Su and Aman Ullah contains the latest research on nonparametric and semiparametric econometrics and statistics These data driven models seek to replace the classical parametric models of the past which were rigid and often linear Chapters by leading international econometricians and statisticians highlight the interface between econometrics and statistical methods for nonparametric and semiparametric procedures They provide a balanced view of new developments in the modeling of cross section time series panel and spatial data Topics of the volume include the methodology of semiparametric models and special regressor methods inverse ill posed and well posed problems methodologies related to additive models sieve regression nonparametric and semiparametric regression and the true error of competing approximate models support vector machines and their modeling of default probability series estimation of stochastic processes and their application in Econometrics identification estimation and specification problems in semilinear time series models nonparametric and semiparametric techniques applied to nonstationary or near nonstationary variables the estimation of a set of regression equations and a new approach to the analysis of nonparametric models with exogenous treatment assignment

The Oxford Handbook of Economic Forecasting Michael P. Clements,David F. Hendry,2011-06-29 This Handbook provides up to date coverage of both new and well established fields in the sphere of economic forecasting The chapters are written by world experts in their respective fields and provide authoritative yet accessible accounts of the key concepts subject matter and techniques in a number of diverse but related areas It covers the ways in which the availability of ever more plentiful data and computational power have been used in forecasting in terms of the frequency of observations the number of variables and the use of multiple data vintages Greater data availability has been coupled with developments in statistical theory and economic analysis to allow more elaborate and complicated models to be entertained the volume provides explanations and

critiques of these developments These include factor models DSGE models restricted vector autoregressions and non linear models as well as models for handling data observed at mixed frequencies high frequency data multiple data vintages methods for forecasting when there are structural breaks and how breaks might be forecast Also covered are areas which are less commonly associated with economic forecasting such as climate change health economics long horizon growth forecasting and political elections Econometric forecasting has important contributions to make in these areas along with how their developments inform the mainstream

Forecasting Non-stationary Economic Time Series Michael P. Clements, David F. Hendry, 1999 This text on economic forecasting asks why some practices seem to work empirically despite a lack of formal support from theory After reviewing the conventional approach to forecasting it looks at the implications for causal modelling presents forecast errors and delineates sources of failure

Financial Surveillance Marianne Frisen, 2008-02-28 This is the first book length treatment of statistical surveillance methods used in financial analysis It contains carefully selected chapters written by specialists from both fields and strikes a balance between the financial and statistical worlds enhancing future collaborations between the two areas and enabling more successful prediction of financial market trends The book discusses in detail schemes for different control charts and different linear and nonlinear time series models and applies methods to real data from worldwide markets as well as including simulation studies

Complex Systems in Finance and Econometrics Robert A. Meyers, 2010-11-03 Finance Econometrics and System Dynamics presents an overview of the concepts and tools for analyzing complex systems in a wide range of fields The text integrates complexity with deterministic equations and concepts from real world examples and appeals to a broad audience

The Art and Science of Econometrics Ping Zong, 2022-05-02 Today econometrics has been widely applied in the empirical study of economics As an empirical science econometrics uses rigorous mathematical and statistical methods for economic problems Understanding the methodologies of both econometrics and statistics is a crucial departure for econometrics The primary focus of this book is to provide an understanding of statistical properties behind econometric methods Following the introduction in Chapter 1 Chapter 2 provides the methodological review of both econometrics and statistics in different periods since the 1930s Chapters 3 and 4 explain the underlying theoretical methodologies for estimated equations in the simple regression and multiple regression models and discuss the debates about p values in particular This part of the book offers the reader a richer understanding of the methods of statistics behind the methodology of econometrics Chapters 5-9 of the book are focused on the discussion of regression models using time series data traditional causal econometric models and the latest statistical techniques By concentrating on dynamic structural linear models like state space models and the Bayesian approach the book alludes to the fact that this methodological study is not only a science but also an art This work serves as a handy reference book for anyone interested in econometrics particularly in relevance to students and academic and business researchers in all quantitative analysis fields

The New Palgrave Dictionary of Economics, 2016-05-18 The

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Perspectives on Integration and Globalisation Helena Marques,Elias Soukiazis,Pedro Cerqueira,2008 Problems of integration and globalisation and the implications of such processes on individual countries have been on the spotlight of the economic debate among economists and politicians over the last decade Both developed and developing countries are involved in the processes of trade and capital liberalisation with the extent of gain or loss depending on their ability to explore the newly arising opportunities and to adapt their economies to the new international environment This volume analyses some of these challenges brought by the movements towards a higher regional integration and higher international interdependency *Computer Intensive Statistical Methods* J. S. Urban. Hjorth,2017-10-19 This book focuses on computer intensive statistical methods such as validation model selection and bootstrap that help overcome obstacles that could not be previously solved by methods such as regression and time series modelling in the areas of economics meteorology and transportation

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Table of Contents Modelling Nonstationary Economic Time Series A Multivariate Approach

1. Understanding the eBook Modelling Nonstationary Economic Time Series A Multivariate Approach
 - The Rise of Digital Reading Modelling Nonstationary Economic Time Series A Multivariate Approach
 - Advantages of eBooks Over Traditional Books
2. Identifying Modelling Nonstationary Economic Time Series A Multivariate Approach
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Modelling Nonstationary Economic Time Series A Multivariate Approach
 - User-Friendly Interface
4. Exploring eBook Recommendations from Modelling Nonstationary Economic Time Series A Multivariate Approach
 - Personalized Recommendations

- Modelling Nonstationary Economic Time Series A Multivariate Approach User Reviews and Ratings
- Modelling Nonstationary Economic Time Series A Multivariate Approach and Bestseller Lists
- 5. Accessing Modelling Nonstationary Economic Time Series A Multivariate Approach Free and Paid eBooks
 - Modelling Nonstationary Economic Time Series A Multivariate Approach Public Domain eBooks
 - Modelling Nonstationary Economic Time Series A Multivariate Approach eBook Subscription Services
 - Modelling Nonstationary Economic Time Series A Multivariate Approach Budget-Friendly Options
- 6. Navigating Modelling Nonstationary Economic Time Series A Multivariate Approach eBook Formats
 - ePub, PDF, MOBI, and More
 - Modelling Nonstationary Economic Time Series A Multivariate Approach Compatibility with Devices
 - Modelling Nonstationary Economic Time Series A Multivariate Approach Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Modelling Nonstationary Economic Time Series A Multivariate Approach
 - Highlighting and Note-Taking Modelling Nonstationary Economic Time Series A Multivariate Approach
 - Interactive Elements Modelling Nonstationary Economic Time Series A Multivariate Approach
- 8. Staying Engaged with Modelling Nonstationary Economic Time Series A Multivariate Approach
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Modelling Nonstationary Economic Time Series A Multivariate Approach
- 9. Balancing eBooks and Physical Books Modelling Nonstationary Economic Time Series A Multivariate Approach
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Modelling Nonstationary Economic Time Series A Multivariate Approach
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Modelling Nonstationary Economic Time Series A Multivariate Approach
 - Setting Reading Goals Modelling Nonstationary Economic Time Series A Multivariate Approach
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Modelling Nonstationary Economic Time Series A Multivariate Approach
 - Fact-Checking eBook Content of Modelling Nonstationary Economic Time Series A Multivariate Approach

- Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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