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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:

Modelling Nonstationary Economic Time Series A Multivariate Approach

**John Hunter, Simon P.
Burke, Alessandra Canepa**



Modelling Nonstationary Economic Time Series A Multivariate Approach:

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 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.

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.

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.

Statistical Models and Methods for Financial Markets Tze Leung Lai, Haipeng Xing, 2008-07-25. The idea of writing this book arose in 2000 when the first author was assigned to teach the required course STATS 240 Statistical Methods in Finance in the new M.S. program in financial mathematics at Stanford which is an interdisciplinary program that aims to provide a master's level education in applied mathematics, statistics, computing, finance and economics. Students in the program had different backgrounds in statistics. Some had only taken a basic course in statistical inference while others had taken a broad spectrum of M.S. and Ph.D. level statistics courses. On the other hand all of them had already taken required core courses in investment theory and derivative pricing and STATS 240 was supposed to link the theory and pricing formulas to real world data and pricing or investment strategies. Besides students in the program the course also attracted many students from other departments in the university further increasing the heterogeneity of students as many of them had a strong background in mathematical and statistical modeling from the mathematical, physical and engineering sciences but no previous experience in finance. To address the diversity in background but common strong interest in the subject and in a potential career as a quant in the financial industry the course material was carefully chosen not only to present basic statistical methods of importance to quantitative finance but also to summarize domain knowledge in finance and show how it can be combined with statistical modeling in financial analysis and decision making. The course material evolved over the years especially after the second author helped as the head TA during the years 2004 and 2005.

State-Space Models with Regime Switching Chang-Jin Kim, Charles R. Nelson, 2017-11-03. Both

state space models and Markov switching models have been highly productive paths for empirical research in macroeconomics and finance This book presents recent advances in econometric methods that make feasible the estimation of models that have both features One approach in the classical framework approximates the likelihood function the other in the Bayesian framework uses Gibbs sampling to simulate posterior distributions from data The authors present numerous applications of these approaches in detail decomposition of time series into trend and cycle a new index of coincident economic indicators approaches to modeling monetary policy uncertainty Friedman s plucking model of recessions the detection of turning points in the business cycle and the question of whether booms and recessions are duration dependent state space models with heteroskedastic disturbances fads and crashes in financial markets long run real exchange rates and mean reversion in asset returns

Mathematical Models in Economics - Volume I Wei-Bin Zhang, 2009-06-10 Mathematical Models in Economics is a component of Encyclopedia of Mathematical Sciences in which is part of the global Encyclopedia of Life Support Systems EOLSS an integrated compendium of twenty one Encyclopedias This theme is organized into several different topics and introduces the applications of mathematics to economics Mathematical economics has experienced rapid growth generating many new academic fields associated with the development of mathematical theory and computer Mathematics is the backbone of modern economics It plays a basic role in creating ideas constructing new theories and empirically testing ideas and theories Mathematics is now an integral part of economics The main advances in modern economics are characterized by applying mathematics to various economic problems Many of today s profound insights into economic problems could hardly be obtained without the help of mathematics The concepts of equilibrium versus non equilibrium stability versus instability and steady states versus chaos in the contemporary literature are difficult to explain without mathematics The theme discusses on modern versions of some classical economic theories taking account of balancing between significance of economic issues and mathematical techniques These two volumes are aimed at the following five major target audiences University and College students Educators Professional practitioners Research personnel and Policy analysts managers and decision makers and NGOs

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