

Spatial Econometrics Methods And Models

'the editors have done an excellent job in bringing together a comprehensive collection of cutting edge research findings on network theory. . .' - Sierdjan Koster, European Spatial Research and Policy

This contributed volume applies spatial and space-time econometric methods to spatial interaction modeling. The first part of the book addresses general cutting-edge methodological questions in spatial econometric interaction modeling, which concern aspects such as coefficient interpretation, constrained estimation, and scale effects. The second part deals with technical solutions to particular estimation issues, such as intraregional flows, Bayesian PPML and VAR estimation. The final part presents a number of empirical applications, ranging from interregional tourism competition and domestic trade to space-time migration modeling and residential relocation.

This monograph deals with spatially dependent nonstationary time series in a way accessible to both time series econometricians wanting to understand spatial econometrics, and spatial econometricians lacking a grounding in time series analysis. After charting key concepts in both time series and spatial econometrics, the book discusses how the spatial connectivity matrix can be estimated using spatial panel data instead of assuming it to be exogenously fixed. This is followed by a discussion of spatial nonstationarity in spatial cross-section data, and a full exposition of non-stationarity in both single and multi-equation contexts, including the estimation and simulation of spatial vector autoregression (VAR) models and spatial error correction (ECM) models. The book reviews the literature on panel unit root tests and panel

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cointegration tests for spatially independent data, and for data that are strongly spatially dependent. It provides for the first time critical values for panel unit root tests and panel cointegration tests when the spatial panel data are weakly or spatially dependent. The volume concludes with a discussion of incorporating strong and weak spatial dependence in non-stationary panel data models. All discussions are accompanied by empirical testing based on a spatial panel data of house prices in Israel.

Spatial Econometrics is a rapidly evolving field born from the joint efforts of economists, statisticians, econometricians and regional scientists. The book provides the reader with a broad view of the topic by including both methodological and application papers. Indeed the application papers relate to a number of diverse scientific fields ranging from hedonic models of house pricing to demography, from health care to regional economics, from the analysis of R&D spillovers to the study of retail market spatial characteristics. Particular emphasis is given to regional economic applications of spatial econometrics methods with a number of contributions specifically focused on the spatial concentration of economic activities and agglomeration, regional paths of economic growth, regional convergence of income and productivity and the evolution of regional employment. Most of the papers appearing in this book were solicited from the International Workshop on Spatial Econometrics and Statistics held in Rome (Italy) in 2006.

Although interest in spatial regression models has surged in recent years, a comprehensive, up-to-date text on these approaches does not exist. Filling this void, Introduction to Spatial Econometrics presents a variety of regression methods used to analyze spatial data samples that violate the traditional assumption of independence between observations. It explores a

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wide range of alternative topics, including maximum likelihood and Bayesian estimation, various types of spatial regression specifications, and applied modeling situations involving different circumstances. Leaders in this field, the authors clarify the often-mystifying phenomenon of simultaneous spatial dependence. By presenting new methods, they help with the interpretation of spatial regression models, especially ones that include spatial lags of the dependent variable. The authors also examine the relationship between spatiotemporal processes and long-run equilibrium states that are characterized by simultaneous spatial dependence. MATLAB® toolboxes useful for spatial econometric estimation are available on the authors' websites. This work covers spatial econometric modeling as well as numerous applied illustrations of the methods. It encompasses many recent advances in spatial econometric models—including some previously unpublished results.

Despite spatial statistics and spatial econometrics both being recent sprouts of the general tree "spatial analysis with measurement"—some may remember the debate after WWII about "theory without measurement" versus "measurement without theory"—several general themes have emerged in the pertaining literature. But exploring selected other fields of possible interest is tantalizing, and this is what the authors intend to report here, hoping that they will suscite interest in the methodologies exposed and possible further applications of these methodologies. The authors hope that reactions about their publication will ensue, and they would be grateful to reader(s) motivated by some of the research efforts exposed hereafter letting them know about these experiences.

The main purpose of this Handbook is to provide overviews and assessments of the state-of-the-art regarding research methods, approaches and applications central to economic

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geography. The chapters are written by distinguished researchers from a variety of disciplines. The book illustrates the use of spatial econometric models to analyze the economic resilience of regions to climate-related shocks. Although climate change is a global externality, climate anomalies can trigger locally disruptive shocks, whose adverse effects on economic growth are transmitted through neighbouring relationships (based on geography, trade, or technological bonds). After laying out the theoretical case for spatial analysis in the study of economic resilience, the book introduces spatial econometric models, their estimation and testing procedures, as well as applications of spatial econometrics in various domains. It then reviews the current literature on the role of space in the propagation of climate shocks, and discusses how adaptation and mitigation policies can leverage spatial dependencies, with a special focus on renewable energy technologies and agricultural productivity. It appeals to scholars of regional and spatial sciences and econometrics as well as those interested in the spatial effects of climate and environmental shocks.

This book aims at meeting the growing demand in the field by introducing the basic spatial econometrics methodologies to a wide variety of researchers. It provides a practical guide that illustrates the potential of spatial econometric modelling, discusses problems and solutions and interprets empirical results.

Spatial econometrics can be defined in a narrow and in a broader sense. In a narrow sense it refers to methods and techniques for the analysis of regression models using data observed within discrete portions of space such as countries or regions. In a broader sense it is inclusive of the models and theoretical instruments of spatial statistics and spatial data analysis to analyze various economic effects such as externalities, interactions, spatial concentration and

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many others. Indeed, the reference methodology for spatial econometrics lies on the advances in spatial statistics where it is customary to distinguish between different typologies of data that can be encountered in empirical cases and that require different modelling strategies. A first distinction is between continuous spatial data and data observed on a discrete space.

Continuous spatial data are very common in many scientific disciplines (such as physics and environmental sciences), but are still not currently considered in the spatial econometrics literature. Discrete spatial data can take the form of points, lines and polygons. Point data refer to the position of the single economic agent observed at an individual level. Lines in space take the form of interactions between two spatial locations such as flows of goods, individuals and information. Finally data observed within polygons can take the form of predefined irregular portions of space, usually administrative partitions such as countries, regions or counties within one country.

The complexity, diversity, and random nature of transportation problems necessitates a broad analytical toolbox. Describing tools commonly used in the field, *Statistical and Econometric Methods for Transportation Data Analysis, Second Edition* provides an understanding of a broad range of analytical tools required to solve transportation problems. It includes a wide breadth of examples and case studies covering applications in various aspects of transportation planning, engineering, safety, and economics. After a solid refresher on statistical fundamentals, the book focuses on continuous dependent variable models and count and discrete dependent variable models. Along with an entirely new section on other statistical methods, this edition offers a wealth of new material. New to the Second Edition A subsection on Tobit and censored regressions An explicit treatment of frequency domain time series

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analysis, including Fourier and wavelets analysis methods New chapter that presents logistic regression commonly used to model binary outcomes New chapter on ordered probability models New chapters on random-parameter models and Bayesian statistical modeling New examples and data sets Each chapter clearly presents fundamental concepts and principles and includes numerous references for those seeking additional technical details and applications. To reinforce a practical understanding of the modeling techniques, the data sets used in the text are offered on the book's CRC Press web page. PowerPoint and Word presentations for each chapter are also available for download.

?This book provides an overview of three generations of spatial econometric models: models based on cross-sectional data, static models based on spatial panels and dynamic spatial panel data models. The book not only presents different model specifications and their corresponding estimators, but also critically discusses the purposes for which these models can be used and how their results should be interpreted.

Spatial Econometrics: Methods and Models Springer Science & Business Media

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.

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The Oxford Handbook of Quantitative Methods in Psychology provides an accessible and comprehensive review of the current state-of-the-science and a one-stop source for learning and reviewing current best-practices in a quantitative methods across the social, behavioral, and educational sciences.

World-renowned experts in spatial statistics and spatial econometrics present the latest advances in specification and estimation of spatial econometric models. This includes information on the development of tools and software, and various applications. The text introduces new tests and estimators for spatial regression models, including discrete choice and simultaneous equation models. The performance of techniques is demonstrated through simulation results and a wide array of applications related to economic growth, international trade, knowledge externalities, population-employment dynamics, urban crime, land use, and environmental issues. An exciting new text for academics with a theoretical interest in spatial statistics and econometrics, and for practitioners looking for modern and up-to-date techniques.

This restructured, updated Third Edition provides a general overview of the econometrics of panel data, from both theoretical and applied viewpoints. Readers discover how econometric tools are used to study organizational and household behaviors as well as other macroeconomic phenomena such as economic growth. The book contains sixteen entirely new chapters; all other chapters have been revised to account for recent developments. With contributions from well known specialists in the field, this handbook is a standard reference for all those involved in the use of panel data in econometrics.

The purpose of models is not to fit the data but to sharpen the questions. S. Karlin, 11th R. A.

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Fisher Memorial Lecture, Royal Society, 20 April 1983 We are proud to offer this volume in honour of the remarkable career of the Father of Spatial Econometrics, Professor Jean Paelinck, presently of the Tinbergen Institute, Rotterdam. Not one to model solely for the sake of modelling, the above quotation nicely captures Professor Paelinck's unceasing quest for the best question for which an answer is needed. His FLEUR model has sharpened many spatial economics and spatial econometrics questions! Jean Paelinck, arguably, is the founder of modern spatial econometrics, penning the seminal introductory monograph on this topic, *Spatial Econometrics*, with Klaassen in 1979. In the General Address to the Dutch Statistical Association, on May 2, 1974, in Tilburg, "he coined the term [spatial econometrics] to designate a growing body of the regional science literature that dealt primarily with estimation and testing problems encountered in the implementation of multiregional econometric models" (Anselin, 1988, p. 7); he already had introduced this idea in his introductory report to the 1966 Annual Meeting of the Association de Science Regionale de Langue Fran~aise. D.S. Prasada Rao), J. O'Donnell), E. Battese)

This volume presents advanced techniques to modeling markets, with a wide spectrum of topics, including advanced individual demand models, time series analysis, state space models, spatial models, structural models, mediation, models that specify competition and diffusion models. It is intended as a follow-on and companion to *Modeling Markets* (2015), in which the authors presented the basics of modeling markets along the classical steps of the model building process: specification, data collection, estimation, validation and implementation. This volume builds on the concepts presented in *Modeling Markets* with an

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emphasis on advanced methods that are used to specify, estimate and validate marketing models, including structural equation models, partial least squares, mixture models, and hidden Markov models, as well as generalized methods of moments, Bayesian analysis, non/semi-parametric estimation and endogeneity issues. Specific attention is given to big data. The market environment is changing rapidly and constantly. Models that provide information about the sensitivity of market behavior to marketing activities such as advertising, pricing, promotions and distribution are now routinely used by managers for the identification of changes in marketing programs that can improve brand performance. In today's environment of information overload, the challenge is to make sense of the data that is being provided globally, in real time, from thousands of sources. Although marketing models are now widely accepted, the quality of the marketing decisions is critically dependent upon the quality of the models on which those decisions are based. This volume provides an authoritative and comprehensive review, with each chapter including: · an introduction to the method/methodology · a numerical example/application in marketing · references to other marketing applications · suggestions about software. Featuring contributions from top authors in the field, this volume will explore current and future aspects of modeling markets, providing relevant and timely research and techniques to scientists, researchers, students, academics and practitioners in marketing, management and economics.

The promising new directions for research and applications described here include alternative model specifications, estimators and tests for regression models and new perspectives on dealing with spatial effects in models with limited dependent variables and space-time data.

Abstract: Three essays comprise this dissertation. The first chapter considers the Two-Stage

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Least-Square (2SLS) and Generalized Method of Moments (GMM) estimators for spatial and temporal autoregressive panel data models under the fixed-effects framework. The proposed 2SLS and GMM estimators are consistent, asymptotically normal and robust against unknown initial conditions. The classical 2SLS estimators are linear with closed-form expressions. The GMM estimators make full use of moment conditions under the standard assumptions and are efficient relative to the 2SLS estimators. The second chapter considers the decision of local school spending in a dynamic game-theoretical model. I formulate a dynamic game model with strategic interaction and show that the local spending follows an exact spatial and temporal autoregressive path in general equilibrium. Empirical work uses local school expenditure data published by the Ohio State Department of Education. Without time effects, the current spending among local school districts are strategically correlated, but including time dummy effects makes such strategic interaction statistically insignificant. The latter contradict the empirical results in recent public finance literature that has a positive reaction slope. Furthermore, I have found that the current spending of the school districts is negatively related with the temporally lagged spending of their neighbors. The third chapter considers specification test, identification and estimation of simultaneous system of spatially interrelated cross-sectional equations. The identification conditions of classical system are extended to the spatial system. Classical 2SLS and 3SLS estimators are derived for the spatial models. A simple Hausman specification test of exogeneity is provided. The methods and techniques presented in this book are focused on spatial data and its use in monitoring agricultural resources, farm management, and regional markets. Spatial econometrics models are introduced for different data types relevant to the statistical units

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adopted in agricultural economics analyses. The theory and procedures of each model are described in a simple, intuitive way and complemented by examples of real data developed using R software. The combined use of statistical methods, new technologies, and economic theory is treated with particular reference to the peculiarities of spatial data for a proper and efficient analysis of agricultural data sets.

This book is concerned with spatial dependence in econometric models, offering a work of reference to the applied researcher. In economics, spatial aspects are usually somewhat disregarded, which - as is shown and quantified here - may seriously impair research results. It presents the basic tool kit of treating cross sectional dependence, which typically occurs between spatial observations. The methods are introduced as straightforward enhancement of standard econometric models and methods, placing emphasis on the practical aspects of their features.

In recent years, spatial analysis has become an increasingly active field, as evidenced by the establishment of educational and research programs at many universities. Its popularity is due mainly to new technologies and the development of spatial data infrastructures. This book illustrates some recent developments in spatial analysis, behavioural modelling, and computational intelligence. World renown spatial analysts explain and demonstrate their new and insightful models and methods. The applications are in areas of societal interest such as the spread of infectious diseases, migration behaviour, and retail

and agricultural location strategies. In addition, there is emphasis on the uses of new technologies for the analysis of spatial data through the application of neural network concepts.

Advancing Quantitative Methods in Criminology and Criminal Justice is designed to promote the understanding of various quantitative research methods and to encourage their use among those seeking answers to questions about crime and justice. To this end a number of top scholars have been assembled to provide their insights on a variety of 'cutting edge' quantitative research techniques. The chapters that appear delve into the state of quantitative methods in the discipline, group-based trajectory modeling, spatial dependence models, structural equation models, meta-analysis, social network designs, panel data modeling, and censored regression techniques. This book will be highly beneficial for readers who seek to stay as current as possible as they pursue answers to questions about crime and justice using quantitative research methods. This book was originally published as a special issue of the Journal of Criminal Justice Education.

Assembling a collection of very prominent researchers in the field, the Handbook of Spatial Statistics presents a comprehensive treatment of both classical and state-of-the-art aspects of this maturing area. It takes a unified, integrated

approach to the material, providing cross-references among chapters. The handbook begins with a historical intro

The Routledge Handbook of Planning Research Methods is an expansive look at the traditions, methods, and challenges of research design and research projects in contemporary urban planning. Through case studies, an international group of researchers, planning practitioners, and planning academics and educators, all recognized authorities in the field, provide accounts of designing and implementing research projects from different approaches and venues. This book shows how to apply quantitative and qualitative methods to projects, and how to take your research from the classroom to the real world. The book is structured into sections focusing on Beginning planning research Research design and development Rediscovering qualitative methods New advances in quantitative methods Turning research into action With chapters written by leading scholars in spatial planning, The Routledge Handbook of Planning Research Methods is the most authoritative and comprehensive handbook on the topic, providing both established and ground breaking coverage of spatial planning research methods. The book is an invaluable resource for undergraduate and graduate level students, young professionals and practitioners in urban, regional, and spatial planning.

Tools such as GIS and remote sensing are increasingly being used in monitoring agricultural resources. As a result, there is need for effective methods for the collection and analysis of agricultural data with particular reference to space. Since land is a key resource in agriculture, most of the data collected are of spatial nature or can be related to a map through geo-referencing techniques of the statistical units. It is now a common practice in many countries that the state statistical agency geo-references typical sampling frames of physical or administrative bodies used in agricultural surveys, not only according to the codes of a geographical nomenclature, but also adding information regarding the exact, or estimated, position of each record. This information is used in agricultural economics to develop advanced models in spatial econometrics. The developments in GIS technology offer growing opportunities to agricultural economists to deal with large and detailed spatial databases, making it possible to combine spatial information from different sources and to produce different models, tabular, and graphic outputs. These tools allow the application of a wide range of operations to spatial information derived from different sources; though without considering the specific nature of the different typology of spatial data. Thus, such an automated process appears to be responsible for the tendency of many practitioners to neglect particularities of spatial data with respect to data

stored in conventional databases. This book attempts to describe the main typology of agricultural data, the most appropriate methods for the analysis together with a detailed description of the available data sources and their collection methods. Topics such as spatial interpolation, point patterns, spatial autocorrelation, survey data analysis, small area estimation, regional data modeling, and spatial econometrics techniques are covered jointly with issues arising from the integration of several data types.

This work examines theoretical issues, as well as practical developments in statistical inference related to econometric models and analysis. This work offers discussions on such areas as the function of statistics in aggregation, income inequality, poverty, health, spatial econometrics, panel and survey data, bootstrapping and time series.

Spatial econometrics deals with spatial dependence and spatial heterogeneity, critical aspects of the data used by regional scientists. These characteristics may cause standard econometric techniques to become inappropriate. In this book, I combine several recent research results to construct a comprehensive approach to the incorporation of spatial effects in econometrics. My primary focus is to demonstrate how these spatial effects can be considered as special cases of general frameworks in standard econometrics, and to outline how they

necessitate a separate set of methods and techniques, encompassed within the field of spatial econometrics. My viewpoint differs from that taken in the discussion of spatial autocorrelation in spatial statistics - e.g., most recently by Cliff and Ord (1981) and Upton and Fingleton (1985) - in that I am mostly concerned with the relevance of spatial effects on model specification, estimation and other inference, in what I call a model-driven approach, as opposed to a data-driven approach in spatial statistics. I attempt to combine a rigorous econometric perspective with a comprehensive treatment of methodological issues in spatial analysis.

Focusing on econometric models that confront estimation and inference issues occurring when sample data exhibit spatial or spatiotemporal dependence, this volume features contributions that provide details regarding estimation and inference based on a variety of econometric methods. provides an overview of spatial econometric models and methods.

The contributed volume collects cutting-edge research in GeoComputational Analysis of Regional Systems. The contributions emphasize methodological innovations or substantive breakthroughs on many facets of the socio-economic and environmental reality of regional contexts.

Spatial Econometrics provides a modern, powerful and flexible skillset to early career

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researchers interested in entering this rapidly expanding discipline. It articulates the principles and current practice of modern spatial econometrics and spatial statistics, combining rigorous depth of presentation with unusual depth of coverage. Introducing and formalizing the principles of, and 'need' for, models which define spatial interactions, the book provides a comprehensive framework for almost every major facet of modern science. Subjects covered at length include spatial regression models, weighting matrices, estimation procedures and the complications associated with their use. The work particularly focuses on models of uncertainty and estimation under various complications relating to model specifications, data problems, tests of hypotheses, along with systems and panel data extensions which are covered in exhaustive detail. Extensions discussing pre-test procedures and Bayesian methodologies are provided at length. Throughout, direct applications of spatial models are described in detail, with copious illustrative empirical examples demonstrating how readers might implement spatial analysis in research projects. Designed as a textbook and reference companion, every chapter concludes with a set of questions for formal or self--study. Finally, the book includes extensive supplementing information in a large sample theory in the R programming language that supports early career econometricians interested in the implementation of statistical procedures covered. Combines advanced theoretical foundations with cutting-edge computational developments in R Builds from solid foundations, to more sophisticated extensions that

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are intended to jumpstart research careers in spatial econometrics Written by two of the most accomplished and extensively published econometricians working in the discipline Describes fundamental principles intuitively, but without sacrificing rigor Provides empirical illustrations for many spatial methods across diverse field Emphasizes a modern treatment of the field using the generalized method of moments (GMM) approach Explores sophisticated modern research methodologies, including pre-test procedures and Bayesian data analysis

The Handbook is written for academics, researchers, practitioners and advanced graduate students. It has been designed to be read by those new or starting out in the field of spatial analysis as well as by those who are already familiar with the field. The chapters have been written in such a way that readers who are new to the field will gain important overview and insight. At the same time, those readers who are already practitioners in the field will gain through the advanced and/or updated tools and new materials and state-of-the-art developments included. This volume provides an accounting of the diversity of current and emergent approaches, not available elsewhere despite the many excellent journals and textbooks that exist. Most of the chapters are original, some few are reprints from the Journal of Geographical Systems, Geographical Analysis, The Review of Regional Studies and Letters of Spatial and Resource Sciences. We let our contributors - develop, from their particular perspective and insights, their own strategies for mapping the part of terrain for which they were

responsible. As the chapters were submitted, we became the first consumers of the project we had initiated. We gained from depth, breadth and distinctiveness of our contributors' insights and, in particular, the presence of links between them.

This is the second volume in a two-part series on frontiers in regional research. It identifies methodological advances as well as trends and future developments in regional systems modelling and open science. Building on recent methodological and modelling advances, as well as on extensive policy-analysis experience, top international regional scientists identify and evaluate emerging new conceptual and methodological trends and directions in regional research. Topics such as dynamic interindustry modelling, computable general equilibrium models, exploratory spatial data analysis, geographic information science, spatial econometrics and other advanced methods are the central focus of this book. The volume provides insights into the latest developments in object orientation, open source, and workflow systems, all in support of open science. It will appeal to a wide readership, from regional scientists and economists to geographers, quantitatively oriented regional planners and other related disciplines. It offers a source of relevant information for academic researchers and policy analysts in government, and is also suitable for advanced teaching courses on regional and spatial science, economics and political science.

The field of spatial econometrics has come to include the methods and models that deal with estimation and testing problems encountered when attempting to implement

regional economic models. Those problems are often characterized by the difficulties associated with assessing the importance of spatial dependence and spatial heterogeneity. This book includes contributions on spatial proximity, spatial patterning and in particular the spatial association (dependence) contained in local map patterns.

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