University of St.Gallen

Course and Examination Fact Sheet: Spring Semester 2020

10,276: Regression Analysis for Spatial Data

ECTS credits: 4

Overview examination/s
(binding regulations see below)
Decentral - examination paper written at home (individual) (60%)
Decentral - examination paper written at home (individual) (40%)

Attached courses
Timetable -- Language -- Lecturer
10,276,1.00 (GSERM) Regression Analysis for Spatial Data -- Englisch -- Adams Zeno , Füss Roland

Course information

Course prerequisites

Students should be interested in spatial topics such as real estate markets, urban economics, crime, pollution, spatial distribution of political preferences, and trade flows. We assume that students are familiar with matrix algebra, and have had courses in probability theory and econometrics. The course emphasizes programming and empirical application. The empirical implementation of spatial models is done in R, hence some familiarity in R is useful but not required for the course. The course is open to students from the PiF/PEF and other external PhD programs.

Learning objectives
The goal of this course is to provide students with the main tools for analyzing and visualizing spatial data. Students will learn how to estimate and interpret a range of spatial models and how to program own models in R.

Course content

This course focuses on the visualization and modeling of spatial data. Examples are taken from different research areas such as political science, empirical international trade, criminology, and real estate. It offers a detailed explanation of individual estimation methods and their implementation in R. In this course, students will learn

- - How to generate a variety of different maps that visualize the location of spatial units
- - How maximum likelihood estimation works and how to set up and optimize a likelihood function in R
- - How to deal with computational problems that are frequently accounted when working with spatial data
- - How to increase computation speed using concentrated maximum likelihood and the matrix exponential spatial specification model
- - How to estimate a spatial regression model both, with cross-sectional and with time-series data
- - How to properly interpret the output from a spatial regression model and how to investigate policy interventions.
- - A basic background on spatial interaction models, heterogeneous coefficient SAR models, and spatio-temporal models

What students do NOT learn in this course:

- - Estimation of spatial regression models with other estimation techniques such as IV, NLS, and Bayesian Methods
- - The use of a specialized Geographic Information System such as ArcGIS

Course structure

Monday:

Lecture 1: 09:15 - 12:00

R Tutorial 1: 13:00 - 15:00

Tuesday:

Lecture 2: 09:15 - 12:00

R Tutorial 2: 13:00 - 15:00

Wednesday:

Lecture 3: 09:15 - 12:00

R Tutorial 3: 13:00 - 15:00

Thursday:

Lecture 4: 09:15 - 12:00

R Tutorial 4: 13:00 - 15:00

Friday:

Lecture 5: 09:15 - 12:00

R Tutorial 5: 13:00 - 15:00

Times and room information in the timetable apply.

Course literature

Mandatory:

LeSage, J., and R.K. Pace (2009), "Introduction to Spatial Econometrics". CRC Press.

Supplementary / voluntary:

Elhorst, J.P. (2014), "Spatial Econometrics: From Cross-Sectional Data to Spatial Panels", Springer.

Holly, S., M.H. Pesaran, and T. Yamagata (2011), "The Spatial and Temporal Diffusion of House Prices in the UK",*Journal of Urban Economics*69, 2-23.

LeSage, J. (2014), "What Regional Scientists Need to Know about Spatial Econometrics",*The Review of Regional Studies*44, 13-32.

Additional course information

Only for PhD students of the University of St.Gallen

PiF students may register via regular bidding forthecourses offered together by PiF and Global School in Empirical Research Methods (GSERM).

All other PhD studentsshouldregister for thecourses offered by Global School in Empirical Research Methods (GSERM),**both viabidding** and **via GSERM** for:

- courses for the curriculum and - optional courses **with** an examination. These will be listed on the scorecard under optional work **(only possible if all required elective courses have already been completed)**.

Please register **only via GSERM** for:

- optional courses **without** an examination and - optional courses **if not all required elective courses have been completed** (not shown on the scorecard)

The registration via GSERM can only be made starting **March 1st 2019**. Earlier registrations have to be kept pending and will not be confirmed.

Examination information

Examination sub part/s

1. Examination sub part (1/2)

Examination time and form
Decentral - examination paper written at home (individual) (60%)

Remark
Paper Replication

Examination-aid rule
Term papers

- Term papers must be written without anyone else's help and in accordance with the known quotation standards, and they must contain a declaration of authorship.
- The documentation of sources (quotations, bibliography) has to be done throughout and consistently in accordance with the APA or MLA standards. The indications of the sources of information taken over verbatim or in paraphrase (quotations) must be integrated into the text in accordance with the precepts of the applicable quotation standard, while informative and bibliographical notes must be added as footnotes (recommendations and standards can be found, for example, in METZGER, C. (2017), Lern- und Arbeitsstrategien (12th ed., Cornelsen Schweiz).
- For any work written at the HSG, the indication of the page numbers both according to the MLA and the APA standard is never optional.
- Where there are no page numbers in sources, precise references must be provided in a different way: titles of chapters or sections, section numbers, acts, scenes, verses, etc.
- For papers in law, the legal standard is recommended (by way of example, cf. FORSTMOSER, P., OGOREK R. et SCHINDLER B. (2018, Juristisches Arbeiten: Eine Anleitung für Studierende (6. Auflage), Zürich: Schulthess, or the recommendations of the Law School).

Supplementary aids
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Examination languages
Question language: English
Answer language: English

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2. Examination sub part (2/2)

Examination time and form
Decentral - examination paper written at home (individual) (40%)

Remark
R Assignments to be solved individually

Examination-aid rule

Term papers

- Term papers must be written without anyone else's help and in accordance with the known quotation standards, and they must contain a declaration of authorship.
- The documentation of sources (quotations, bibliography) has to be done throughout and consistently in accordance with the APA or MLA standards. The indications of the sources of information taken over verbatim or in paraphrase (quotations) must be integrated into the text in accordance with the precepts of the applicable quotation standard, while informative and bibliographical notes must be added as footnotes (recommendations and standards can be found, for example, in METZGER, C. (2017), Lern- und Arbeitsstrategien (12th ed., Cornelsen Schweiz).
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Supplementary aids
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Examination languages
Question language: English
Answer language: English

Examination content

- SAR model, SDM model, CML, MESS, Spatial Interaction model, Spatial Panel model, HSAR model

Implementing maximum likelihood estimation in R: Full Maximum Likelihood, Concentrated Maximum Likelihood, Matrix Exponential Spatial Specification.

Examination relevant literature

- LeSage, J., and R.K. Pace (2009), "Introduction to Spatial Econometrics". CRC Press, Chapter 1, 2, 3, 4, 8, and 9.
- LeSage, J., and Y.-Y. Chih (2016), "Interpreting Heterogeneous Coefficient Spatial Autoregressive Panel Models", *Economics Letters* 142, 1-5.

Please note

Please note that this fact sheet alone is binding and has priority over any other information such as StudyNet (Canvas), personal databases or faculty members' websites and information provided in their lectures, etc.

Any possible references and links within the fact sheet to information provided by third parties are merely supplementary and informative in nature and are outside the University of St.Gallen's scope of responsibility and guarantee.

Documents and materials that have been submitted no later than the end of term time (CW21) are relevant to central examinations.

Binding nature of the fact sheet:

- Information about courses and examination time (central/decentral) and examination typestarting from the beginning of the bidding on 23 January 2020
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for decentral examinations after the 4th semester week on 16 March 2020
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for central examinations as from the starting date for examination registration on 6 April 2020

Please consult the fact sheet again after these deadlines have expired.