



## Course and Examination Fact Sheet: Spring Semester 2019

### 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 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.

#### 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 for the courses offered together by PiF and Global School in Empirical Research Methods (GSERM).

All other PhD students should register for the courses offered by Global School in Empirical Research Methods (GSERM), **both via bidding 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 1<sup>st</sup> 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

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## 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

We would like to point out to you that this fact sheet has absolute priority over other information such as StudyNet, faculty members' personal databases, information provided in lectures, etc. When will the fact sheets become binding?

- Information about courses and examination time (central/decentral and grading form): from the start of the bidding process on 24 January 2019
- Information about decentral examinations (examination-aid rule, examination content, examination relevant literature): after the 4th semester week on 18 March 2019
- Information about central examinations (examination-aid rule, examination content, examination relevant literature): from the start of the enrolment period for the examinations on 08 April 2019

Please look at the fact sheet once more after these deadlines have expired.