SPATIAL ECONOMETRICS
ECON 4545

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ESCUELA DE VERANO 2016

Salón: **SD 715**
Fechas: 20 de junio al 1 de julio (No incluye sábados)
Horario 1: 10:00 a 12:00 M (i)
Horario 2: 1:00 a 2:00 PM (ii)

Programa sujeto a cambios

1. Overview of the Course

We will begin at the beginning of spatial analysis, around mid-18th century. The introduction will be at a general level of epidemiology. Then we will slowly move to spatial statistics, spatial econometrics and finally to, spatial urban economics. We will touch on the contrast between time-series and spatial dependence, and the need for moving from linear to non-linear models; from fixed to space varying coefficient models. More specifically, in the context of urban econometrics, we will study the price of housing; we will argue that not only the spatial dependence of house prices, but also the dependence in the variability (risk) of prices need to be considered, leading to non-linear spatial autoregressive conditional heteroskedastic (SARCH) model. The major highlight of the course will be how to test various spatial models, particularly, in the context of possible misspecification.

The theories covered in the course will be illustrated in the computer lab by substantial applications using data from several countries, including Colombia. The aim of the computer lab is to introduce to students the problems related with handling spatial data an2d the properties of the basic econometric models. With hands-on experience, students will have a broad overview of the most recent developments and refinements of the basic models used in spatial econometrics. At the end of the course, students will have acquired the necessary skills to build, estimate and test these models in the R environment.

Prerequisites: A first course in econometrics.

2. Course Outline

1. History of Spatial Analysis

    a. Spatial Analysis in Time of Cholera: Work of Dr. John Snow (1854)
    b. Design of Experiments and Sample Survey: Work of Fisher and Mahalanobis (1920-1950)
    c. First Formal Paper on Spatial Analysis: PAP Moran (1948)

References: [2], [12], [13], [15], [17], [18], [19],[20], [23], [24], [26]

2. Theory of Spatial Analysis

    a. Why (Spatial) Dependence Matter?
    b. Spatial Heterogeneity
    c. Contrast between Time-Series and Spatial Dependence
    d. Different Spatial Models
    e. Estimation of Spatial Models

References: [1], [2], [4], [9], [11], [14], [16], [21], [22], [25], [27], [28]

3. Testing Spatial Models

    a. General Principles of Testing
    b. Testing with Misspecified Models
    c. Specification Tests for Spatial Models
    d. Spatial Panel Models

References: [2], [3], [5]

4. Applications of Spatial Analysis

    a. Applications of Spatial Analysis to Crime (Columbus, OH, USA)
    b. Applications of Spatial Analysis House Prices (Boston, MA, USA)
    c. Applications of Spatial Analysis to Regional Growth Convergence (of 61 countries)
    d. Special Spatial Applications Using Colombian Data

References: [2], [6], [7], [8], [10]

3. Important dates

First day of instruction: June 20th
Final Exam: July 4th

4. Grades

Final Exam 100%
Note: This is a take-home exam due on July 4th. The wording of the exam will be given in advance.

- Re-grading: If you have complaints regarding the results of your final exam, you should submit your complaints in writing within 48 hours from the time when the graded examination was returned. After reviewing a written complaint, your entire examination will be graded again, and the result will be final.

- Make-up Examination: To be fair, all students are expected to take examinations at the same time. Generally, students are discouraged from taking the make-up instead of the regular examination.

- Final grade: Is the grade of the final exam without rounding.

5. Withdrawing from the course

The student may withdraw the course, without refund, up to one business day before the date of the final test stipulated by the teacher. The University will not return the money for tuition payed for these summer courses.

6. References

[1] Luc Anselin. *Spatial econometrics: methods and models*, volume 4. Springer Science & Business Media, 2013.

[2] Luc Anselin and Anil K. Bera. Spatial dependence in linear regression models with an introduction to spatial econometrics. *Statistics Textbooks and Monographs*, 155:237-290, 1998.

[3] Luc Anselin, Anil K. Bera, Raymond Florax, and Mann J Yoon. Simple diagnostic tests for spatial dependence. *Regional science and urban economics*, 26(1):77-104, 1996.

[4] Giuseppe Arbia. *Spatial econometrics: statistical foundations and applications to regional convergence*. Springer Science & Business Media, 2006.

[5] Anil K. Bera and Mann J Yoon. Speci_cation testing with locally misspeci_ed alternatives. *Econometric theory*, 9(04):649-658, 1993.

[6] Anne C. Case. Spatial patterns in household demand. *Econometrica: Journal of the Econo-metric Society*, pages 953-965, 1991.

[7] Anne C. Case. Neighborhood inuence and technological change. *Regional Science and Urban Economics*, 22(3):491-508, 1992.

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[9] A.D. Cli_ and J.K. Ord. *Spatial Processes: Models & Applications*. Pion, 1981.

[10] Timothy G. Conley and Giorgio Topa. Socio-economic distance and spatial patterns in unemployment. *Journal of Applied Econometrics*, 17(4):303-327, 2002.

[11] N.A.C. Cressie. *Statistics for spatial data*. Wiley series in probability and mathematical statistics: Applied probability and statistics. J. Wiley, 1993.

[12] R.A. Fisher. *The design of experiments.* Hafner Pub. Co., 1966.

[13] Robert C. Geary. The contiguity ratio and statistical mapping. *The incorporated statistician*,5(3):115-146, 1954.

[14] Harry H. Kelejian and Ingmar R. Prucha. A generalized moments estimator for the autoregressive parameter in a spatial model. *International economic review*, 40(2):509-533, 1999.

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[16] Lung-Fei Lee. Consistency and e_ciency of least squares estimation for mixed regressive, spatial autoregressive models. *Econometric theory*, 18(02):252-277, 2002.

[17] Prasanta Chandra Mahalanobis. On large-scale sample surveys. *Philosophical Transactions of the Royal Society of London B: Biological Sciences,* 231(584):329-451, 1944.

[18] Patrick AP Moran. The interpretation of statistical maps. *Journal of the Royal Statistical Society. Series B (Methodological)*, 10(2):243-251, 1948.

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[21] Brian D Ripley. *Statistical inference for spatial processes*. Cambridge university press, 1991.

[22] Brian D Ripley. *Spatial statistics*, volume 575. John Wiley & Sons, 2005.

[23] J. Snow. *On the Mode of Communication of Cholera*. John Churchill, 1855.

[24] Waldo R. Tobler. A computer movie simulating urban growth in the detroit region. *Economic Geography,* 46:234-240, 1970.

[25] Melanie M. Wall. A close look at the spatial structure implied by the car and sar models.

Journal of Statistical Planning and Inference, 121(2):311{324, 2004.

[26] Peter Whittle. On stationary processes in the plane. *Biometrika,* pages 434-449, 1954.

[27] Yutaka Yasui and Subhash Lele. A regression method for spatial disease rates: an estimating function approach. *Journal of the American Statistical Association*, 92(437):21-32, 1997.

[28] Hao Zhang. On estimation and prediction for spatial generalized linear mixed models. *Biometrics*, 58(1):129-136, 2002.