

COURSE CODE & COURSE TITLE: ECON734: Spatial Econometrics

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COURSE DESCRIPTION

Spatial dependence or social interaction/network among the geographical units, economic agents or social actors, such as neighbourhood effects, peer effects, copy-cattling, and externalities, has received an increasing attention by regional scientists, urban economists, econometricians, statisticians, etc. Spatial econometric models and methods have been proved to be very effective tools in dealing with issues related to spatial dependence or social interaction. Applications are seen not only in specialized fields of regional science, urban economics, real estate and economic geography, but also increasingly in more traditional fields of economics and finance, including demand analysis, labour economics, public economics, international economics, agricultural and environmental economics, asset pricing model, and arbitrage pricing theory.

This course introduces common spatial econometric models, including spatial regression models, spatial panel data models, and spatial dynamic panel data models, with **spatial lag**, **spatial error**, or **spatial Durbin** terms being used to model the spatial dependence, social interactions or network effects. Common estimation and inference methods such as (quasi) maximum likelihood and GMM, and common tests such as LM tests, are introduced **in a non-technical manner**. **Empirical illustrations** of the methods are presented using **Matlab software**. If time permits, recent advances in “spatial econometrics” will be discussed.

LEARNING OBJECTIVES

Upon completion of the course, students should be able to identify and formally test the possible existence of spatial dependence in the empirical studies they face in practice, and be able to apply suitable spatial econometrics models and methods learnt from the class to address issues related to spatial dependence, social interaction, social network, etc. As spatial econometrics is a fast-growing subfield of econometrics with many problems remaining open, this course also serves as a channel for students to find suitable research topics for their PhD programs.

ASSESSMENT METHODS

Class Assignments : 50%
Class Project : 50%
Total : 100%

CLASS TIMINGS

Class sessions are of 3-hour duration per week: **Tue. 12:00-15:15**; over a period of six weeks starting from **Oct. 14, 2019**. Each session will involve a lecture, and an empirical illustration using Matlab.

MAIN READINGS: [Lecture Notes \(Chapters 1-6\)](#).

RECOMMENDED TEXTS

1. Anselin, Luc (1988). *Spatial Econometrics: Methods and Models*, (Dordrecht: Kluwer).
2. Elhorst P.J. (2014). *Spatial econometrics: from Cross-Sectional Data to Spatial Panels*, Heidelberg: Springer.
3. LeSage, J.P. and R..K. Pace (2009). *Introduction to Spatial Econometrics*, Boca Raton: Taylor and Francis.

RECOMMENDED PAPERS

1. Anselin, L., 2001. Spatial Econometrics. In: *A Companion to Theoretical Econometrics*, edited by Badi H. Baltagi. Blackwell Publishing.
2. Anselin, L., Bera, A. K., 1998. Spatial dependence in linear regression models with an introduction to spatial econometrics. In: *Handbook of Applied Economic Statistics*, edited by Aman Ullah and David E. A. Giles}. New York: Marcel Dekker
3. Anselin, L., Bera, A. K., Florax, R., Yoon, M. J. (1996). Simple diagnostic tests for spatial dependence. ***Regional Science and Urban Economics* 26**, 77-104.
4. Lee, L. F., 2004. Asymptotic distributions of quasi-maximum likelihood estimators for spatial autoregressive models. ***Econometrica* 72**, 1899-1925.
5. Yu, J., de Jong, R., Lee, L. F., 2008. Quasi-maximum likelihood estimators for spatial dynamic panel data with fixed effects when both n and T are large. ***Journal of Econometrics* 146**, 118-134.
6. Lee, L. F., Yu, J. 2010. Estimation of spatial autoregressive panel data models with fixed effects. ***Journal of Econometrics* 154**, 165-185.
7. Yang, Z. L. (2015a). A general method for third-order bias and variance correction on a nonlinear estimator. ***Journal of Econometrics*, 186**, 178-200.
8. Yang, Z. L. (2015b). LM tests of spatial dependence based on bootstrap critical values. ***Journal of Econometrics* 185**, 33-39.
9. Liu, S. F., Yang, Z. L. (2015a). Asymptotic distribution and finite-sample bias correction of QML estimators for spatial error dependence Model. ***Econometrics* 3**, 376-411.
10. Liu, S. F., Yang, Z. L. (2015b). Improved Inferences for Spatial Regression Models. ***Regional Science and Urban Economics* 55**, 55-67.
11. Su, L. J., Yang, Z. L. (2015). QML estimation of dynamic panel models with spatial errors. ***Journal of Econometrics* 185**, 230-258.
12. Yang, Z. L. (2018). Unified M-estimation of fixed-effects spatial dynamic panel data models with short panels. ***Journal of Econometrics* 205**, 423-447.

Outline Sessions

Subject to change. Please check (<http://www.mysmu.edu/faculty/zlyang/>) for the up-to-date version.

Week	Topic	Readings
1	Introduction: spatial econometrics, common spatial econometric models, spatial weights matrix, methods of maximum likelihood (ML) or quasi-ML, M-estimation method, generalized method of moments;	Slides: Chap. 1
2	Spatial linear regression models I: QML estimation and inference; LM tests for spatial dependence; Empirical illustration.	Slides: Chap. 2
3	Spatial linear regression models II: GMM estimation and inference; Empirical illustration.	Slides: Chap. 3
4	Spatial panel data models: Random effects model, Fixed effects model; QMLE; LM tests; Empirical illustration.	Slides: Chap. 4
5	Spatial dynamic panel data models: QMLE based on large panels; M-estimation based on short panels; Empirical illustration.	Slides: Chap. 5
6	Recent advances in "spatial econometrics".	Slides: Chap. 6

*The extent of discussion on this topic depends on time availability.



Topics to be covered

- 1. Introduction**
 - a. Spatial econometrics
 - b. Common spatial econometric models
 - c. Spatial weights matrix
 - d. Methods of maximum likelihood (ML) or quasi-ML
 - e. M-estimation method
 - f. generalized method of moments

- 2. Spatial Regression Models**
 - a. Quasi maximum likelihood (QML) estimation
 - b. GMM estimation
 - c. LM and robust LM tests for spatial dependence
 - d. Models with group interactions, contextual factors and fixed effects
 - e. Empirical application

- 3. Spatial Panel Data Models**
 - a. Random effects models
 - b. Fixed effects models
 - c. Correlated random effects model
 - d. LM and robust LM tests for spatial dependence
 - e. Empirical application

- 4. Spatial Dynamic Panel Data Models**
 - a. Initial conditions
 - b. Random effects models
 - c. Fixed effects models
 - d. Correlated random effects model
 - e. LM and robust LM tests for spatial dependence
 - f. Empirical application

- 5. Recent advances in spatial econometrics**

(the extent of discussion on this topic depends on time availability).

COURSE AREA: Advanced Research Topic (ART)

PRE-REQUISITE/CO-REQUISITE/MUTUALLY EXCLUSIVE COURSE(S): ECON611 Econometrics I

GRADING BASIS: Graded

COURSE UNIT: 0.5CU