

# General Instructions for Research Paper

ECON747: SPATIAL ECONOMETRIC MODELS AND METHODS, Term I 2024-25

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1. **Type of research paper.** The research paper for this course emphasizes the numerical implementations of the spatial econometric models and methods learnt from the class using **Matlab** and **Python**. You may focus on one class of models and methods for your research paper. Your understanding of the key papers related to the chosen topic is a key factor in assessing your research paper, empirical illustrations are an essential element, and theoretical extensions of the existing methods are strongly encouraged. Topics include but not limited to:
  - [1] *Spatial Linear Regression with Matlab and Python.*  
(Key references: [1], [2], [3] in the list given below)
  - [2] *Hypothesis Testing in Spatial Linear Regression with Matlab and Python.*  
(Key references: [4], [5], [6], in the list given below)
  - [3] *Spatial Panel Data Analyses with Matlab and Python.*  
(Key references: [7], [8], [9], in the list given below)
  - [4] *Hypothesis Testing in Spatial Panel Data Models with Matlab and Python.*  
(Key references: [4], [5], [10] in the list below)
  - [5] *Dynamic Spatial Panel Data Analyses with Matlab and Python.*  
(Key references: [11], [12], in the list given below)
  - [6] *Hypothesis Testing in Dynamic Spatial Panels with Matlab and Python.*  
(Key references: [13] in the list below)
2. **Initial submission.** You are required to send your draft project in a single PDF file to the instructor ([zlyang@smu.edu.sg](mailto:zlyang@smu.edu.sg)), two days before the oral presentation.
3. **Oral presentation.** Oral presentation will be on **Week 14, in classroom**. Each group is allocated **40min**, with 35min for presentation and 5min for questions.
4. **Final submission:** submit the final version of your research paper before **10:00pm Sunday, Week 14**; in a single pdf file to instructor's email address.
5. **Project style.** The language of the project is English. The project should have a cover page, be printed on one side of the paper, be 1.5-line spaced, have a margin of one inch on all four sides, and contain **around 30 pages**. Illustrations and tables should be incorporated into the text, but make sure that an illustration or a table does not run into two pages.
  - The **title page** should list the full title, authors' information (name, email address, and school), an abstract, and key words;

- and the title page should also supply an **abstract** of up to 120 words, which concisely summarizes your work.

There is no maximum length for the project. The paper should be divided (reasonably) into sections and if necessary, into subsections. Mathematical symbols should be typewritten. Equations that are referred to latter should be numbered, and the numbers should be placed in parentheses in the righthand side margin. Tables and figures should be numbered and entitled (e.g., Table 1. *title*; Figure 1. *title*). All table columns should have an explanatory heading. **Please refer to** the accepted version of a paper in the reading list.

- 6. Reference style.** References should be cited in the text as name and year within brackets and listed at the end of the paper alphabetically. Where reference is made to more than one work by the same author published in the same year, identify each citation in the text as, e.g., Collins (1998a, b). Where a paper has three or more authors, cite in the text as, e.g., Collins *et al.* (1998). All references must be complete, accurate, and consistent in formats for journal papers as in [1], for books as in [2], and for a chapter in an edited book as in [3]:

- [1] Lee, T., White, H., Granger C., 1993. Testing for neglected nonlinearity in time series models. *Journal of Econometrics* **56**: 269-290.
- [2] Brock, W., Hsieh, D., LeBaron, B., 1991. *Nonlinear Dynamics, Chaos, and Instability: Statistical Theory and Economic Evidence*. MIT: Cambridge, MA.
- [3] Hansen, B. E., 1993. The likelihood ratio test under non-standard conditions: testing the Markov switching model of GNP. In *Nonlinear Dynamics, Chaos and Econometrics*, Pesaran MH, Potter SM (eds). Wiley: Chichester.

**7. Assessment Criteria:**

- Understanding of the key papers (20%)
- Correctness and Effectiveness of the Matlab and Python codes (20)
- Empirical illustration(s) (20%)
- Innovativeness of the methods and applications (20%)
- Quality of the academic writing (20%)

**8. Academic Integrity.** Please be mindful of copyright issues. Indicate clearly

- the source of materials that you may quote/use/duplicate in your project, and
- the author(s)/papers of a result/theorem that you used in your project.

**References:**

- [1] Lee, L. F. (2004). Asymptotic distributions of quasi-maximum likelihood estimators for spatial autoregressive models. *Econometrica* **72**, 1899-1925.

- [2] Liu, S. F. and Yang, Z. L. (2015a). Asymptotic distribution and finite-sample bias correction of QML estimators for spatial error dependence Model. ***Econometrics*** **3**, 376-411.
- [3] Liu, S. F. and Yang, Z. L. (2015b). Modified QML estimation of spatial autoregressive models with unknown heteroskedasticity and normality. ***Regional Science and Urban Economics***, **52**, 50-70.
- [4] Baltagi, B. H. and Yang, Z. L. (2013a). Standardized LM tests for spatial error dependence in linear or panel regressions. ***Econometrics Journal*** **16**, 103-134.
- [5] Baltagi, B. H. and Yang Z. L. (2013b). Heteroskedasticity and non-normality robust LM tests of spatial dependence. ***Regional Science and Urban Economics*** **43**, 725-739.
- [6] Yang, Z. L. (2015b). LM tests of spatial dependence based on bootstrap critical values. ***Journal of Econometrics*** **185**, 33-39.
- [7] Lee, L. F. and Yu, J. (2010). Estimation of spatial autoregressive panel data models with fixed effects. ***Journal of Econometrics*** **154**, 165-185.
- [8] Yang, Z. L., Yu, J. H, and Liu, S. F. (2016). Bias correction and refined inferences for fixed effects spatial panel data models. ***Regional Science and Urban Economics*** **61**, 52-72.
- [9] Liu, S. F. and Yang, Z. L. (2020). Robust estimation and inference of spatial panel data models with fixed effects. ***Japanese Journal of Statistics and Data Science*** **3**, 257–311.
- [10] Lee, L.-F. and Ju, J. H. (2012). Spatial panels: random components versus fixed effects. ***International Economic Review*** **53**, 1369-1412.
- [11] Yu, J., de Jong, R. and 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.
- [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.
- [13] Yang, Z. L. (2021). Joint tests for dynamic and spatial effects in short dynamic panel data models with fixed effects and heteroskedasticity. ***Empirical Economics*** **60**, 51-92.