Accepted Manuscript

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PII: S0304-4076(17)30016-7
DOI: http://dx.doi.org/10.1016/j.jeconom.2017.02.001
Reference: ECONOM 4344

To appear in: *Journal of Econometrics*

Received date : 3 December 2015
Revised date : 30 January 2017
Accepted date : 4 February 2017

Please cite this article as: Li, K., Fixed-effects dynamic spatial panel data models and impulse response analysis. *Journal of Econometrics* (2017), http://dx.doi.org/10.1016/j.jeconom.2017.02.001

Fixed-effects dynamic spatial panel data models and impulse response analysis*

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February 5, 2017

Abstract

Real data often have complicated correlations over cross section and time. Such correlations are of particular interests in empirical studies. This paper considers using high order spatial lags and high order time lags to model complicated correlations over cross section and time. We propose to use the quasi maximum likelihood (QML) method to estimate the model. We establish the asymptotic theory of the quasi maximum likelihood estimator (QMLE), including the consistency and limiting distribution, under large N and large T setup, where N denotes the number of individuals and T the number of time periods. We investigate the problem of estimating impulse response functions and the associated $(1-\alpha)$-confidence intervals. Average direct, indirect and total impacts are defined along the same spirits of LeSage and Pace (2009) under the dynamic spatial panel data setup. The estimation and inferential theory for the three impacts are studied. Model selection issue is also considered. Monte Carlo simulations confirm our theoretical results and show that the QMLE after bias correction has good finite sample performance.

Key Words: Dynamic spatial models; Panel data models; Quasi maximum likelihood estimation; Impulse response analysis; Confidence intervals; Model selection.

JEL: C31; C33.

*The author would like to thank the co-editor Jianqing Fan, an associate editor and four anonymous referees for their critical/constructive comments, which greatly improve the quality of this paper. The author is deeply indebted to Professor Qi Li for his constant encouragement, stimulating comments and valuable supports on this research. Financial supports from NSFC No.71571122 and No.71201031 are gratefully acknowledged. All errors are mine.