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

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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.

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