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Cross-Sectional and Spatial Dependence in Panels with R

Inside the R project, the 'plm' package provides for basic and advanced treatment of econometric panel datasets. Infrastructure as data classes and methods and transformation functions are provided together with the estimators and tests that are standard in the literature. The more recent subject of cross-sectional and spatial dependence is tackled as well under form of diagnostic tests and robust covariance matrix estimators.

A specialized package for static spatial panels, 'splm', contains estimators and tests for panels with spatial dependence of the lag and/or error forms, possibly together with individual (fixed or random) effects. All these specifications can be estimated either by maximum likelihood, which is statistically efficient but computationally demanding, or by generalized moments, which is a much faster and asymptotically equivalent estimator allowing for much bigger datasets.

Some new developments from 'splm' regard a novel specification, originally due to Baltagi, Song, Jung and Koh, which is at the frontier of methodological research and lacked production quality implementations to date: the coexistence of spatial with serial correlation in the errors and possibly also of random effects and spatial lags. The comprehensive maximum likelihood estimator will be illustrated together with its subcases and with the conditional C.1-3 tests for one effect given the others.

While spatial panel specifications are usually applied to "wide" panels with a large cross-sectional dimension and a short temporal one, the cross-sectional correlation problem has found different approaches and solutions in the literature on panel time series. After a short introduction to the general treatment of heterogeneous panel estimators in 'plm', the "augmentation" (or Common Correlated Effects) approach of Pesaran to cross-sectional and spatial dependence in panels will be illustrated, together with some new R implementations of the three basic tools of his framework: the heterogeneous CCEMG estimator, the pooled CCEP estimator and the cross-sectional correlation-robust CIPS unit root test. A short example (robust estimation of an error correction model) concludes highlighting the convenience of the R approach.

Lastly, if time permits, some new developments in the scarcely researched subject of testing for spatial ("weak") dependence under unobserved common factors generating "strong" cross-sectional correlation will be hinted at, linking the two main subjects together.