Chapter 1
Introduction: Spatial Statistics

A wide array of topics in spatial statistics introduce methodological controversy: aggregate versus disaggregated data inference (e.g., the ecological fallacy), modelling the spatial covariance versus the spatial inverse covariance matrix, including fixed and/or random effects terms in a model specification, spatial autocorrelation specified as part of the mean response versus part of the variance parameter, and methods for simulating spatially autocorrelated random variables.

A spatial statistician often pursues a data-driven, rather than a model-specification-driven, analysis. This perspective reflects the sampling design origins of statistical inference. A critical issue in this approach is accounting for all trends in a data set, in turn allowing residual values to be reduced to ones that mimic independent and identically distributed (iid) random variables. These trends may be related to covariate as well as autoregressive relationships. Complexity associated with these trends often is a function of noisy (e.g., considerable dispersion), dirty (e.g., nonlinear relationships), and/or messy (e.g., unbalanced factors) data. Experience with the normal-linear statistical model (especially with regard to variable transformations) has taught that flexibility is needed in order to properly address this complexity.

In this part, a certain number of working papers are brought together, most of which have been presented and commented on in departmental colloquia and/or in special sessions devoted to spatial statistics and its applications at national and international conferences.

Although this set of papers appears to be articulated with rather loose couplings, these papers share the common thread of dealing with spatial autocorrelation and its associated problems in an advanced way. Hopefully they will stimulate fresh thinking about some of the more complicated problems in spatial statistics.

D.A. Griffith, J.H.P. Paelinck, *Non-standard Spatial Statistics and Spatial Econometrics*, Advances in Geographic Information Science 1,
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