

## Publication

### Estimating Interdependence Across Space, Time and Outcomes in Binary Choice Models Using Pseudo Maximum Likelihood Estimators

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Binary outcome models are frequently used in Political Science. However, such models have proven particularly difficult in dealing with interdependent data structures, including spatial autocorrelation, temporal autocorrelation, as well as simultaneity arising from endogenous binary regressors. In each of these cases, the primary source of the estimation challenge is the fact that jointly determined error terms in the reduced-form specification are analytically intractable due to a high-dimensional integral. To deal with this problem, simulation approaches have been proposed, but these are computationally intensive and impractical for datasets with thousands of observations. As a way forward, in this paper we demonstrate how to reduce the computational burden significantly by (i) introducing analytically tractable pseudo maximum likelihood estimators for latent binary choice models that exhibit interdependence across space, time and/or outcomes, and by (ii) proposing an implementation strategy that increases computational efficiency considerably. Monte-Carlo experiments demonstrate that our estimators perform similarly to existing alternatives in terms of error, but require only a fraction of the computational cost.

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