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Summary: This paper is concerned with cross-sectional dependence arising because observations are interconnected through an observed network. Following [P. Doukhan and S. Louhichi, Stochastic Processes Appl. 84, No. 2, 313–342 (1999; Zbl 0996.60020)], we measure the strength of dependence by covariances of nonlinearly transformed variables. We provide a law of large numbers and central limit theorem for network dependent variables. We also provide a method of calculating standard errors robust to general forms of network dependence. For that purpose, we rely on a network heteroskedasticity and autocorrelation consistent (HAC) variance estimator, and show its consistency. The results rely on conditions characterized by tradeoffs between the rate of decay of dependence across a network and network’s denseness. Our approach can accommodate data generated by network formation models, random fields on graphs, conditional dependency graphs, and large functional-causal systems of equations.

MSC:
62P20 Applications of statistics to economics
60F05 Central limit and other weak theorems
62M30 Inference from spatial processes
91D30 Social networks; opinion dynamics

Keywords:
network dependence; random fields; central limit theorem; networks; law of large numbers; cross-sectional dependence; spatial processes

Software:
PMTK

Full Text: DOI arXiv

References:
[12] Comets, F.; Janžura, M., A central limit theorem for conditionally centered random fields with an application to markov


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