The 6th International Iranian Workshop on Stochastic Processes

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My three talks concern quite different statistical models, but common themes are dependence and nonstationarity.

Plenary talk:

Parametric Inference on Strong Dependence

We consider the estimation of parametric fractional time series models in which not only is the memory parameter unknown, but one may not know whether it lies in the stationary/invertible region or the nonstationary or noninvertible regions. We consider a conditional-sum-of-squares estimate which is expected to be efficient under Gaussianity, though we do not impose this assumption. Because the estimates are only implicitly defined, the need to deal with the consequently large admissible parameter space, on which the rate of convergence of the objective function varies considerably, causes difficulties. For a quite general univariate model, we establish consistency and asymptotic normality for the estimate, with root-n rate whatever the value of the memory parameter. For a multivariate model we establish asymptotic normality of a one-step estimate based on an initial root–n-consistent estimate. Finite-ample performance of the procedure is examined by means of a Monte Carlo experiment, and an an empirical application to real data is also included.

Workshop talks:

1. **Estimation of Temporal and Spatial Power Law Trends**

Power law or generalized polynomial regressions with unknown real-valued exponents and unknown coefficients are considered, observations being recorded on an equally-spaced grid or regular lattice, with weakly dependent errors. In general, consistency of nonlinear least squares estimates of exponents and coefficients (which all converge at different rates) cannot be established by the usual techniques, but requires a more delicate treatment; our approach may apply in other situations in which mixed-rates asymptotics occur. Asymptotic normality is also established, with the precise outcome indicating some notable features. A Monte Carlo study of finite-sample performance is included. Issues of statistical inference and its implementation, and of efficiency of the estimates, are discussed, along with various possible extensions.

2. **Nonparametric and Semiparametric Regression with Spatial Data**

Nonparametric and semiparametric regression with spatial, or spatio-temporal, data is considered. Dependence and heterogeneity of both observables and unobservable errors are major features. Instead of mixing conditions, a (possibly non-stationary) linear process is assumed for the errors, allowing for long range, as well as short-range, dependence, while decay in dependence in explanatory variables is described using a measure based on the departure of the joint density from the product of marginal densities. A basic triangular array setting is employed, with the aim of covering various patterns of spatial observation. Sufficient conditions are established for consistency and asymptotic normality of kernel regression estimates in the nonparametric model, and of coefficient estimates in a semiparametric partly linear regression model. When the cross-sectional dependence is sufficiently mild, the asymptotic variance in the central limit theorem is the same as when observations are independent; otherwise, the rate of convergence is slower. We discuss application of our conditions to spatial autoregressive models, and models defined on a regular lattice. A Monte Carlo study of finite-sample performance, and an empirical example, are included.