Limit Theory for Autocorrelations of Heavy-Tailed Nonlinear Time Series Models

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ABSTRACT

In this talk, a general theory for the sample ACF and sample ACVF of a stationary sequence $(X_t)_{t\in\mathbb{Z}}$ will be described. Two assumptions are made: a mixing condition weaker than strong mixing and a regular variation condition on the finite–dimensional distributions of the process. These conditions are sufficiently weak to include a broad class of examples such as linear processes with regularly varying noise, bilinear processes with either regularly varying or normally distributed noise, and ARCH(1) processes. The distributional limits of the sample ACF can be random, provided that the variance of the marginal distribution is infinite and the process is non–linear. This is in contrast to infinite variance linear processes. If the process has a finite second but infinite fourth moment, then the sample ACF is consistent with scaling rates that grow at a slower rate than the standard $\sqrt{n}$. Consequently, asymptotic confidence bands are wider than those constructed in the classical theory. The theory applied to an ARCH(1) process will also be demonstrated. (Part of this work is joint with Bojan Basrak.)