

Richard A. Davis, Columbia University

APPLICATIONS OF DISTANCE CORRELATION TO TIME SERIES

Abstract: The use of empirical characteristic functions for inference problems, including estimation in some special parametric settings and testing for goodness of fit, has a long history dating back to the 70s (see for example, Feuerverger and Mureika (1977), and Csörgő (1981)). More recently, there has been renewed interest in using empirical characteristic functions in other inference settings. The distance covariance and correlation, developed by Szekely and Rizzo (2007) for measuring dependence and testing independence between two random vectors, are perhaps the best known illustrations of this. We apply these ideas to stationary univariate and multivariate time series to measure lagged auto- and cross-dependence in a time series. Assuming strong mixing, we establish the relevant asymptotic theory for the empirical auto- and cross-distance correlation functions. We also apply the auto-distance correlation function (adcf) to the residuals of an autoregressive processes as a test of goodness of fit. Under the null that an autoregressive model is true, the limit distribution of the empirical adcf can differ markedly from the corresponding one for an iid sequence. We illustrate the use of the empirical adcf for testing dependence and cross-dependence of time series in a variety of different contexts.

This talk is based on joint work with Muneya Matsui, Thomas Mikosch, and Phyllis Wan.