

Trend assessment in a long memory dependence model using the discrete wavelet transform

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Abstract

In this paper we consider trend to be smooth deterministic changes over long scales, and tackle the problem of trend estimation in the presence of long memory errors (slowly decaying autocorrelations). Using the fractionally differenced (FD) processes as a motivating example of such a long memory process, we demonstrate how the discrete wavelet transform (DWT) is a natural choice at extracting a polynomial trends from such an error process. We investigate the statistical properties of the trend estimate obtained from the DWT, and provide point-wise and simultaneous confidence intervals for the estimate. Based on evaluating the power in the trend estimate relative to the estimated errors, we provide a test of nonzero trend. We finish by applying the methods to a climatological example.