

Anestis Antoniadis · Andrey Feuerverger
Paulo Gonçalves

Wavelet-based estimation for univariate stable laws

Received: 10 November 2003 / Revised: 6 July 2005 / Published online: 11 May 2006
© The Institute of Statistical Mathematics, Tokyo 2006

Abstract Stable distributions are characterized by four parameters which can be estimated via a number of methods, and although approximate maximum likelihood estimation techniques have been proposed, they are computationally intensive and difficult to implement. This article describes a fast, wavelet-based, regression-type method for estimating the parameters of a stable distribution. Fourier domain representations, combined with a wavelet multiresolution approach, are shown to be effective and highly efficient tools for inference in stable law families. Our procedures are illustrated and compared with other estimation methods using simulated data, and an application to a real data example is explored. One novel aspect of this work is that here wavelets are being used to solve a parametric problem, rather than a nonparametric one, which is the more typical context in wavelet applications.

Keywords Wavelets · Stable laws · Empirical characteristic function · Estimation · Efficiency · Completeness · Regularization