Máster en Estadística Aplicada

Seminario

Prof. N. Leonenko (Cardiff University, UK)

Asymptotic properties of the partition function and applications

(joint work with D.Grahovac and M.S.Taqqu)

Abstract

The so-called partition function is a sample moment statistic based on blocks of data and it is often used in the context of multifractal processes. It will be shown that its behaviour is strongly influenced by the tail of the distribution underlying the data either in i.i.d. and weakly dependent cases. These results will be exploited to develop graphical and estimation methods for the tail index of a distribution. The performance of the tools proposed is analyzed and compared with other methods by means of simulations and examples. Linear fractional stable motion is an example of a self-similar stationary increments stochastic process exhibiting both long-range dependence and heavy- tails. We propose methods that are able to estimate simultaneously the self-similarity parameter and the tail parameter. These methods are based on the asymptotic behavior of the so-called "empirical structure function", a statistic which resembles a sample moment of the process. We show and use the fact that the rate of growth of the empirical structure function is determined by the Hurst parameter and the tail index. We test the methods on simulated data and apply them to network traffic and solar flares data.

References

[1] Grahovac, D. and Leonenko, N and Taqqu, M. S. (2014) Scaling properties of the structure function of linear fractional stable motion and estimation of its parameters, Journal of Statistical Physics, Published online, DOI 10.1007/s10955-014-1126-4

[2] Grahovac, D., Jia. M., Leonenko, N. and Taufer, E. (2015) Asymptotic properties of the partition function and applications in tail index inference of heavy-tailed data, Statistics, 49, N6, 1221-1242.

[3] Grahovac, D. and Leonenko, N (2014) Detecting multifractal stochastic processes under heavy-tailed effects, Chaos, Solitons, Fractals, 65, 78-89