NONPARAMETRIC REGRESSION UNDER DEPENDENT ERRORS WITH INFINITE VARIANCE

LIANG PENG[1] AND QIWEI YAO[2]

[1]*School of Mathematics, Georgia Institute of Technology, Atlanta, GA 30332-0160, U.S.A.,*
e-mail: peng@math.gatech.edu
[2]*Department of Statistics, London School of Economics, London, WC2A 2AE, U.K.,*
e-mail: q.yao@lse.ac.uk

Abstract. We consider local least absolute deviation (LLAD) estimation for trend functions of time series with heavy tails which are characterised via a symmetric stable law distribution. The setting includes both causal stable ARMA model and fractional stable ARIMA model as special cases. The asymptotic limit of the estimator is established under the assumption that the process has either short or long memory autocorrelation. For a short memory process, the estimator admits the same convergence rate as if the process has the finite variance. The optimal rate of convergence $n^{-2/5}$ is obtainable by using appropriate bandwidths. This is distinctly different from local least squares estimation, of which the convergence is slowed down due to the existence of heavy tails. On the other hand, the rate of convergence of the LLAD estimator for a long memory process is always slower than $n^{-2/5}$ and the limit is no longer normal.

Key words and phrases: ARMA, fractional ARIMA, heavy tail, least absolute deviation estimation, long memory, median, stable distribution, time series.