Joint temporal and contemporaneous aggregation of random-coefficient AR(1) processes

Vytautė Pilipauskaitė and Donatas Surgailis (Vilnius University)

March 29, 2014

We study joint temporal and contemporaneous aggregation of N independent copies of AR(1) process with random-coefficient $a \in [0,1)$, when N and time scale n increase to infinity simultaneously. Assuming that a has a density, regularly varying at $a = 1$ with exponent $-1 < \beta < 1$, different joint limits of normalized aggregated partial sums are shown to exist when $N^{1/(1+\beta)}/n$ tends to (i) ∞, (ii) 0, (iii) $0 < \mu < \infty$. The new limit process arising under (iii), admits a representation as a Poisson stochastic integral on the product space $(0,\infty) \times C(\mathbb{R})$. It also enjoys 'intermediate' properties between fractional Brownian motion limit in (i) and sub-Gaussian limit in (ii). Related results for some network traffic processes were obtained in Mikosch, Resnick, Rootzén and Stegeman (2002), Gaigalas and Kaj (2003) and other works.