

Synthetic high-frequency financial time series: Numerical study of free random Wishart-Lévy matrices

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We review numerical methods for the Monte Carlo simulation of synthetic high-frequency financial time series, especially 1) uncoupled continuous-time random walks with a Lévy alpha-stable distribution of tick-by-tick log-returns and a stretched exponential distribution of intertrade durations and 2) autoregressive processes (GARCH-ACD). We discuss the analysis of correlation matrices of time series with fat-tailed log-returns, concentrating on the eigenvalue spectra of random Lévy and free random Lévy matrices (FRLM) in the Wishart ensemble. We show in detail how theoretical equations for the eigenvalue density can be obtained in the FRLM case, and compare the analytical results with numerical ones. Moreover, we mention how asynchronous time series can be sampled with the Fourier method as an alternative to a grid of regular observation times with previous tick interpolation.

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