ARCH-GARCH approaches to modeling high frequency financial data

Boris Podobnik[1], *Plamen Ch. Ivanov*[2], *Kaushik Matia*[2], *Ivo Grosse*[3], and *H. Eugene Stanley*[2]

[1]*Faculty of Civil Engineering, University of Rijeka, Rijeka, Croatia*
[2]*Center for Polymer Studies and Department of Physics, Boston University, Boston, MA 02215*
[3]*Institute of Plant Genetics, Gatersleben, Germany*

We model the time series of the high frequency S&P 500 index by the GARCH process to account for the long-range correlations in the absolute values of index changes. For conditional distribution we use truncated Lévy distribution. Due to the choice for conditional distribution, the unconditional distribution corresponding to the GARCH model is specified by a crossover from Lévy stable power-law to a power law with an exponent outside the Lévy range. We analyze temporal aggregation or the sum of n variables of the GARCH process and show that the probability distribution exhibits stable behavior in power-law tails for a broad range of values n — a feature which is observed in the probability distribution of the high frequency S&P 500 index. We replace the GARCH process by the two-component FIARCH process to account for a crossover found in the data between two power-law regimes in correlations of the absolute values of the index changes.