Extended abstract: "Distinguishing between types of multifractality: Evidence from high-frequency data"

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Extended abstract

In the paper, we apply generalized Hurst exponent approach (GHE), which was recently shown to outperform the other methods in Barunik & Kristoufek [On Hurst exponent estimation under heavy-tailed distributions, Physica A, doi:10.1016/j.physa.2010.05.025], to distinguish between two types of multifractality – either caused by a broadness of distribution or by correlations in moments of the underlying process.

In the procedure, we firstly estimate a spectrum of the generalized Hurst exponents $H(q)$ for different moments q. To distinguish between true multifractality and spurious multifractality caused by finite sample properties of the data set, we simulate a monofractal process with the Hurst exponent $H(2)$ equal to the one of the studied series. By doing so, we obtain the monofractal series with the same level of long-range dependence. The monofractal series is simulated 100 times. We then calculate a measure of multifractality $\Delta H(q) = H(1) - H(10)$ and further use the 2.5% and 97.5% quantiles as confidence intervals for the null hypothesis of monofractality. If $\Delta H(q)$ of the original process falls outside of the confidence intervals, the process is multifractal.

If the process is found to be multifractal, we further distinguish between the two types. To do so, we apply a similar procedure as described above. We compare the spectrum of generalized Hurst exponents with the spectra of shuffled series. This way, we obtain the confidence intervals of $\Delta H(q)$ with a null hypothesis that the multifractality is caused by distributional properties solely.

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If $\Delta H(q)$ of the original series falls outside of the confidence intervals, the multifractality is also caused by the correlations. We also show the robustness of the method on Markow-switching multifractal model. Found correlation multifractality is important for potential modeling of the time series. Therefore, the main aim of the research is to uncover the multifractality caused by correlations since the multifractality caused solely by distributional properties can be hardly used for the series modeling.

To further illustrate the usage of the method, it is applied on the high-frequency data of S&P500 stock index. We show that the multifractality of the series evolves and changes in time and can be potentially signaling the changes in investors behavior.