Modeling of financial time series

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Financial time series, consisting in the evolution of asset's prices over time, are characterized by complex statistical properties such as long-range correlations, heavy-tailed distributions, intermittency, and temporal asymmetries due to causality effects [3]. The development of accurate models for these time series is crucial in finance, for prediction tasks and for understanding the inner workings of markets.

State-of-the-art models, such as multifractals [1] [2], fail to completely capture all relevant properties. The recently introduced wavelet phase harmonics [4] [5] leverage the correlations of phase-adjusted complex wavelet coefficients to provide improved models.

The goals of this project are to review existing models of financial time series, and to analyze the new information captured by wavelet phase harmonics.

Références

[1] A. Fisher B. Mandelbrot and L. Calvet. *A Multifractal Model of Asset Returns.* Cowles Foundation discussion paper No. 1164, 1997.

[2] J. Delour J.F. Muzy and E. Bacry. *Modelling fluctuations of financial time series : from cascade process to stochastic volatility model.* The European Physical Journal B - Condensed Matter and Complex Systems, 17(3) :537–548, 2000.

[3] J.F. Muzy G. Zumbach L. Borland, J.-P. Bouchaud. *The dynamics of financial markets – Mandelbrot's multifractal cascades, and beyond*, pages 1–25. Wilmott Magazine, March 2005.

[4] J.-P. Bouchaud S. Mallat R. Leonarduzzi, G. Rochette. *Maximum-entropy scattering models for financial time series.* Proc. IEEE Int. Conf. Acoust., Speech, and Signal Proc. (ICASSP), 2019.

[5] S. Zhang S. Mallat and G. Rochette. *Phase Harmonic Correlations and Convolutional Neural Networks.* IMA Journal of Information and Inference, 2019.