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Abstract:

We study the well-known multiplicative Lognormal cascade process in which the multiplication of Gaussian and Lognormally distributed random variables yields time series with intermittent bursts of activity. Due to the non-stationarity of this process and the combinatorial nature of such a formalism, its parameters have been estimated mostly by fitting the numerical approximation of the associated non-Gaussian pdf to empirical data, cf. Castaing et al. [Physica D, 46, 177 (1990)]. More recently, an alternative estimator based upon *q*th order absolute moments has been introduced by Kiyono et al. [Phys. Rev. E 76 41113 (2007)]. In this paper, we pursue this moment-based approach further and develop a more rigorous Generalized Method of Moments (GMM) estimation procedure to cope with the documented difficulties of previous methodologies. We show that even under uncertainty about the actual number of cascade steps, our methodology yields very reliable results for the estimated intermittency parameter. Employing the Levinson-Durbin algorithm for best linear forecasts, we also show that estimated parameters can be used for forecasting the evolution of the turbulent flow. We compare forecasting results from the GMM and Kiyono et al.'s procedure via Monte Carlo simulations. We finally test the applicability of our approach by estimating the intermittency parameter and forecasting of volatility for a sample of financial data from stock and foreign exchange markets.

Keywords: Random Lognormal cascades, GMM estimation, best linear forecasting, volatility of financial returns.

JEL classification: C20, G12

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