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# The Log S-fbm Nested Factor Model

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**Abstract :** The Nested factor model was introduced by Bouchaud and al., where the asset return fluctuations are explained by common factors representing the market economic sectors and residuals (noises) sharing with the factors a common dominant volatility mode in addition to the idiosyncratic mode proper to each residual. This construction infers that the factors-residuals log volatilities are correlated. Here, we consider the case of a single factor where the only dominant common mode is a S-fbm process (introduced by Peng, Bacry and Muzy) with Hurst exponent H around 0.11 and the residuals having in addition to the previous common mode idiosyncratic components with Hurst exponents H around 0. The reason for considering this configuration is twofold: preserve the Nested factor model's characteristics introduced by Bouchaud and al. and propose a framework through which the stylized fact reported by Peng and al. is reproduced, where it has been observed that the Hurst exponents of stock indices are large as compared to those of individual stocks. In this work, we show that the Log S-fbm Nested factor model's construction leads to a Hurst exponent of single stocks being the ones of the idiosyncratic volatility modes and the Hurst exponent of the index being the one of the common volatility modes. Furthermore, we propose a statistical procedure to estimate the Hurst factor exponent from the stock returns dynamics together with theoretical guarantees, with good results in the limit where the number of stocks N goes to infinity. Last but not least, we show that the factor can be seen as an index constructed from the single stocks weighted by specific coefficients.

**Keywords :** hurst exponent, log S-fbm model, nested factor model, small intermittency approximation
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