

Using the Scaling Analysis to Characterize Financial Markets

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Nowadays the scaling concept is increasingly applied outside the physical sciences domain. In the recent years, its application to financial markets, initiated by Mandelbrot in the 1960, has largely increased also in consequence of the abundance of available data. Until now most of the work has concentrated in studies of particular market be it Foreign Exchange, Stock or Fixed Income. These studies showed that empirical scaling laws hold in all these markets.

These properties involve simultaneously very different time scales and should be an ideal candidate to characterize markets. To explore this issue, we perform an empirical analysis of daily data across different financial markets to examine the similarities or differences of the scaling properties. We consider different financial markets: foreign exchange rates, stock market indices and bond futures. At the same time, we study very developed as well as emerging markets in order to see if the scaling properties differ between the two and if they can serve in measuring the development of the market.

For these data, we analyze the scaling spectral density $S(f) \sim f^{-\beta}$ with f being the frequency. The observed power laws differ from the spectral density of a Brownian motion ($\beta = 2$) and are very stable across markets. The Hurst exponents H are also computed and compared with the scaling exponents. The value of the Hurst exponent differs for emerging markets from the values of more mature markets.