

Outline

Information

Scaling of the distribution of fluctuations of financial market indices

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Abstract

We study the distribution of fluctuations of the S&P 500 index over a time scale Δt by analyzing three distinct databases. Database (i) contains approximately 1,200,000 records, sampled at 1-min intervals for the 12-year period 1981–1996; database (ii) contains 8696 daily records for the 25-year period 1970–1996. We compute the probability distributions of returns over a time scale Δt , where Δt varies approximately over a factor of 10⁴—from 1 min up to more than one month. We find that distributions for $\Delta t < 4$ d (1560 min) are consistent with a power-law asymptotic behavior, with an exponent $\alpha \approx 3$, well outside the stable Lévy regime $0 < \alpha < 2$. To test the consistency of the S&P result, we perform a parallel analysis on two other financial market indices. Database (iv) contains 3560 daily records of the NIKKEI index for the 14-year period 1984–1997, and database (v) contains 10,000 daily records of the DAX index for the period 1980–1997. We find that the distributions of the DAX and NIKKEI indices are also consistent with a power-law asymptotic behavior, with an exponent $\alpha \approx 3$, well outside the stable Lévy regime $0 < \alpha < 2$. Our results suggest that the power-law asymptotic behavior is a universal feature of financial market indices.

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