

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 13-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 FTSE 100 index for the period 1980–1997. We find that the distributions of returns for $\Delta t < 4$ d are consistent with a power-law asymptotic behavior, with an exponent $\alpha \approx 3$, well outside the stable Lévy regime $0 < \alpha < 2$. We find that the distributions of returns for $\Delta t > 4$ d are consistent with a power-law asymptotic behavior, with an exponent $\alpha \approx 3$, well outside the stable Lévy regime $0 < \alpha < 2$. We find that the distributions of returns for $\Delta t > 4$ d are consistent with a power-law asymptotic behavior, with an exponent $\alpha \approx 3$, well outside the stable Lévy regime $0 < \alpha < 2$.

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