

Scaling and Memory in Volatility Return Intervals in Financial Markets

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For both stock and currency markets, we study the return intervals τ between the daily volatilities of the price changes that are above a certain threshold q . We find that the distribution function $P_q(\tau)$ scales with the mean return interval $\bar{\tau}$ as $P_q(\tau) = \bar{\tau}^{-1} f(\tau/\bar{\tau})$. The scaling function $f(x)$ is similar in form for all seven stocks and for all seven currency data bases analyzed, and $f(x)$ is consistent with a power law form, $f(x) \sim x^{-\gamma}$ with $\gamma \sim 2$. We also quantify how the conditional distribution $P_q(\tau|\tau_0)$ depends on the previous return interval τ_0 , and find that small (large) return intervals are more likely to be followed by small (large) return intervals. This "clustering" of the volatility return intervals is a new phenomenon, which we relate to the long-term correlations known to be present in the volatility.