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Nonstationary Increments, Scaling Distributions, and Variable Diffusion Processes in Financial Markets GEMUNU GUNARATNE, KEVIN BASSLER, JOESEPH MCCAULEY, University of Houston — Arguably the most important problem in quantitative finance is to understand the nature of stochastic processes that underlie market dynamics. One aspect of the solution to this problem involves determining characteristics of the distribution of fluctuations in returns. Empirical studies conducted over the last decade have reported that they are non-Gaussian, scale in time, and have power-law (or fat) tails. However, these studies implicitly assume that the underlying process has stationary increments. We explicitly show that this assumption is not valid for the Euro-Dollar exchange rate between 1999-2004. In addition, we find that fluctuations in returns of the exchange rate are uncorrelated and scale as power-laws for certain time intervals during each day. This behavior is consistent with a diffusive process with a diffusion coefficient that depends both on the time and the price change. Within scaling regions, we find that sliding interval methods can generate fat-tailed distributions as an artifact.

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