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# Estimating fractal dimension using stable distributions and exploring long memory through ARFIMA models in Athens Stock Exchange

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## Abstract

It is argued that the study of the correct specification of returns distributions has attractive implications in financial economics. This study estimates Levy-stable (fractal) distributions that can accurately account for skewness, kurtosis, and fat tails. The Levy-stable family distributions are parametrized by the Levy index (α), 0 < (α), ≤ 2, and include the normal distribution as a special case (α = 2). The Levy index, α, is the fractal dimension of the probability space. The unique feature of Levy-stable family distributions is the existence of a relationship between the fractal dimension of the probability space andthe fractal dimensionof the time series. This relationshipis simply expressed in terms of Hurst exponent (H), i.e. α = 1/ H. In addition, Hurst exponent is related to long-memory effects. Thus, estimating the Levy index allows us to determine

long-memory effects. The immediate practical implication of the present work is that on the one hand we estimate the shape of returns distributions and on the other hand we investigate the fractal dimensions. Overall, then, the Levy-stable family distributions methodology appears to be useful for analysing the returns distribution, for understanding the fractal dimension of returns and for providing the researcher with direct insights into the long-memory effects of stock returns. A second approach to test the long memory hypothesis is attempted in this paper. This test involves an estimation of the ARFIMA models. A comparative analysis of the two approaches indicates the existence of long-memory in the Athens Stock Exchange. The results of this study are based on a sample of stocks from the Athens Stock Exchange using daily data.

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