Parameter estimation of stable laws

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Stable laws form a four-parameter class of infinitely divisible distributions that have many mathematically intriguing properties. They allow skewness and heavy tails and are proposed as models for various processes in physics, finance and elsewhere. Alas, explicit representations for the density function of stable laws in terms of elementary functions are unknown. The deficiency of closed form for density complicates the estimation of parameters of stable distributions. A number of techniques are based on the empirical characteristic function. The motivation for this study arises from one of such procedures, known as the method of moments [1]. The method yields explicit point estimators for all four parameters but leaves open the problem that these estimates depend on an arbitrary choice of two pairs of arguments of the characteristic function. In this study an amended version of the method of moments is proposed. To validate the effectiveness of the estimates extensive simulation experiments over the entire parameter space are carried out. The performance of estimation procedure is illustrated with an application to non-life insurance claims.

References

[1] Press, S. J. (1972). Estimation in univariate and multivariate stable distribution. *Journal of the American Statistical Association* **67**, 842–846.