

Estimating the Tail Index of Pareto-Levy Distributions Using a Neural Network as a Committee Machine

Renaud Piccinini, Ph.D.

University of Nebraska, 2005

Advisor: John Geppert

The Normal distribution appears to be a poor fit for stocks returns empirical distributions, which display leptokurtosis. Although multiple explanations have been advanced, the most plausible of them hypothesizes that returns are randomly and independently drawn out of a stable Pareto-Levy distribution with $\alpha < 2$. An important feature of this group of distributions is that for $\alpha < 1$, none of the moments exist, and for α strictly between 1 and 2 exclusively, all moments of order greater than one (for instance the variance) do not exist.

The financial and statistical literature has produced multiple estimators for the parameters of stable Pareto-Levy distributions, especially for α . These various estimators seldom agree, and are at best able to provide the researcher with a rather wide interval of confidence for the true value of this parameter. This dissertation revises the relative quality of these estimators, and then presents a best-of-breed estimator by optimally combining the best estimators with a neural network.

This new estimator is then used to confirm the superior fit of α -stable distributions over the Gaussian hypothesis. A study of the long term stability of certain stocks' α 's reveals that this parameter can be stable over very long periods of time.

