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Proportionate vs disproportionate distribution of wealth of two individuals in a tempered Paretian ensemble

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(Submitted on 23 Jun 2011)

We study the distribution P(\omega) of the random variable $\omega = x - 1$ (x 1 + x 2), where x 1 and x 2 are the wealths of two individuals selected at random from the same tempered Paretian ensemble characterized by the distribution $\Psi(x) \sim \phi(x)/x^{1 + \alpha}$, where $\alpha > 0$ is the Pareto index and ϕ is the cut-off function. We consider two forms of ϕ in the cut-off function. bounded function $\phi(x) = 1$ for L $\phi(x) = 1$, and zero otherwise, and a smooth exponential function $\phi(x) = \exp(-L/x - x/H)$. In both cases $\phi(x)$ has moments of arbitrary order.

We show that, for \alpha > 1, P(\omega) always has a unimodal form and is peaked at $\omega = 1/2$, so that most probably $x_1 \cdot x_2$. For 0 < 1/2\alpha < 1 we observe a more complicated behavior which depends on the value of \delta = L/H. In particular, for \delta < \delta c - a certain threshold value - P(\omega) has a three-modal (for a bounded \phi(x)) and a bimodal M-shape (for an exponential \phi(x)) form which signifies that in such ensembles the wealths x_1 and x_2 are disproportionately different.

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