Quantitative Finance > General Finance

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

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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 $\phi(x)$ is the cut-off function. We consider two forms of \phi(x): a bounded function \phi(x) = 1 for L \leq x \leq H, and zero otherwise, and a smooth exponential function \phi(x) = \exp(-L/x - x/H). In both cases \Psi(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 \approx x_2. For 0 < \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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