Money and Income Distributions in Society – random exchange times lead to fat Pareto tails.

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The distribution of income or wealth has been shown via numerous examples to have broadly universal features that remain unchanged both over time and across different societies. We review various recent approaches to modelling these distributions and then focus on a model of interacting agents that allows agents to both save and exchange wealth at random. Closed equations for the wealth distribution are developed using a mean field approximation. We show that, subject to certain well defined approximations, when all agents have the same fixed savings propensity, these equations yield a conjecture proposed by Patriarca, Chakraborti and Kaski for the form of the stationary income distribution. If the savings propensity is chosen according to some random distribution we show further that the wealth distribution for large values of wealth displays a Pareto like power law tail, i.e. $P(m)$~$m^{1+\alpha}$. However the value of α for the model is exactly unity. Exact numerical simulations for the model illustrate how, as the savings distribution function narrows to zero, the wealth distribution changes from a Pareto form to an exponential function. Intermediate regions of wealth may be approximately described by a power law with $\alpha>1$. But, the tail exponent α never reaches values of 1.6 − 1.7 that characterize empirical wealth data. This conclusion is not changed if three body agent exchange processes are allowed. However, if pairs of agents are allowed to exchange of money at random times rather than equally spaced discrete times, the tail exponent can take on values that are different from unity and are dependent on the savings parameter in the model. In this way, realistic values of the tail exponent may be recovered.