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Statistical Mechanics of Money, Income, and Wealth

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In Ref. [1], we proposed an analogy between the exponential Boltzmann-Gibbs distribution of energy in physics and the equilibrium probability distribution of money in a closed economic system. Analogously to energy, money is locally conserved in interactions between economic agents, so the thermal Boltzmann-Gibbs distribution function is expected for money. Since then, many researchers followed and expanded this idea [2]. Much work was done on the analysis of empirical data, mostly on income, for which a lot of tax and census data is available. We demonstrated [3] that income distribution in the USA has a well-defined two-class structure. The majority of population (97-99%) belongs to the lower class characterized by the exponential Boltzmann-Gibbs ("thermal") distribution. The upper class (1-3% of population) has a Pareto power-law ("superthermal") distribution, whose parameters change in time with the rise and fall of stock market. We proposed a concept of equilibrium inequality in a society, based on the principle of maximal entropy, and quantitatively demonstrated that it applies to the majority of population. Income distribution in other countries shows similar patterns. For more references, see http://www2.physics.umd.edu/∼yakovenk/econophysics.html.

References:

[1] A. A. Dragulescu and V. M. Yakovenko, "Statistical mechanics of money", Eur. Phys. J. B **17**, 723 (2000).

[2] "Econophysics of Wealth Distributions", edited by A. Chatterjee, S. Yarlagadda, and B. K. Chakrabarti, Springer, 2005.

[3] A. C. Silva and V. M. Yakovenko, "Temporal evolution of the 'thermal' and 'superthermal' income classes in the USA during 1983-2001", Europhys. Lett. **69**, 304 (2005).