Unraveling the Ergodic Assumption: Implications for Wealth and Income Inequality in Advanced Economies[1]

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Abstract

Wealth and income inequality have been rising quite rapidly in most advanced countries in recent decades (Piketty 2014). In contrast to these empirical developments, many economic models rely on the assumption that a stationary distribution of wealth or income exists and is reached relatively quickly. In more formal terms, this standard assumption implicitly assumes that rescaled wealth and income are *ergodic* variables, meaning that the ensemble average (of all individuals) is equal to the time average (of a typical individual). However, to date there exists little to no evidence to suggest that this assumption holds true. On the contrary, especially in times of growing inequality, median wealth and income are likely to grow slower than the ensemble average.

This issue has been recently addressed in field of ergodicity economics. For doing so, Berman et al. (2021) introduced the Reallocating Geometric Brownian Motion model (RGBM), which enables empirical testing of the ergodic assumption. The RGBM merges the noisy multiplicative growth of the Geometric Brownian Motion with a simple reallocation mechanism, allowing for both ergodic and non-ergodic regimes. Berman et al. (2021) find for the U.S. that rescaled wealth is not regularly ergodic and has been consistently non-ergodic since the 1980s. To better understand current wealth and income dynamics, it is relevant to know whether these results also apply to (a) other countries and (b) alternative distributional variables, most importantly income. Building on the approach of Berman et al. (2021), I therefore aim to empirically test the ergodicity assumption for additional countries, for both wealth and income.

Utilizing long-term data from the World Inequality Database (WID), preliminary findings reveal that wealth can be characterized as *„quasi non-ergodic“* (Bouchaud and Farmer, 2023) in France,

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Germany, the Netherlands, and the United Kingdom. Even during periods when rescaled wealth exhibited ergodic behavior, convergence times were excessively lengthy (often surpassing a hundred years), rendering the theoretical stationary distribution of limited practical significance. Notably, since the 1980s, rescaled wealth has been non-ergodic in all countries under study, indicating that wealth is becoming increasingly concentrated and that the distribution is not converging toward an equilibrium state. These findings suggest that models assuming ergodicity, or the existence of a unique stationary distribution, might underestimate the rate at which inequality is currently increasing. The non-ergodic dynamics also present a political challenge as inequality continues to grow rapidly. In this context, the extended convergence times can be said to highlight the necessity for political interventions to be sufficiently large to yield observable effects within an individual's lifetime.

References

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