

Accepted Manuscript

New functional forms of Lorenz curves by maximizing Tsallis entropy of income share function under the constraint on generalized Gini index

A. Khosravi Tanak, G.R. Mohtashami Borzadaran, Jafar Ahmadi

PII: S0378-4371(18)30922-1
DOI: <https://doi.org/10.1016/j.physa.2018.07.050>
Reference: PHYSA 19875

To appear in: *Physica A*

Received date: 5 June 2018
Revised date: 29 June 2018

Please cite this article as: A. Khosravi Tanak, G.R. Mohtashami Borzadaran, J. Ahmadi, New functional forms of Lorenz curves by maximizing Tsallis entropy of income share function under the constraint on generalized Gini index, *Physica A* (2018), <https://doi.org/10.1016/j.physa.2018.07.050>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



New functional forms of Lorenz curves by maximizing Tsallis entropy of income share function under the constraint on generalized Gini index

A. Khosravi Tanak^{a,1}, G. R. Mohtashami Borzadaran^{b,*}, Jafar Ahmadi^b

^aDepartment of Statistics, Velayat University, Iranshahr, Iran

^bDepartment of Statistics, Ferdowsi University of Mashhad, Mashhad, Iran

Abstract

The Lorenz curve is one of the most powerful tools in the analysis of the size distribution of income and wealth. In the past decades, many authors have proposed different functional forms for estimating Lorenz curves using a variety of approaches. In this paper, new functional forms are derived by maximizing Tsallis entropy of income share function subject to a given generalized Gini index. The obtained Lorenz curves are fitted to the income data sets of three Asian countries in 1988 and their relative performances with respect to some well-known parametric models of Lorenz curves are compared using two types of goodness of fit measures.

Keywords: Share function, Lorenz curve, Tsallis entropy, Maximum entropy, Generalized Gini index.

1. Introduction

The Lorenz curve introduced by Lorenz [1] is widely used as a powerful statistical instrument for illustrating the size distribution of income or wealth and as a device for examining the inequality in the distribution. Finding an appropriate functional form is an important practical and theoretical problem. The Lorenz curve defined as the relationship between the cumulative proportion of income and the cumulative proportion of income earner units. Let X be a non-negative and absolutely continuous income random variable with the cumulative distribution function (cdf) F , finite mean μ and the quantile function $F^{-1}(x) = \inf\{t : F(t) \geq x\}$. The Lorenz curve of X is defined by

$$L(p) = \int_0^p s(t)dt, \quad 0 \leq p \leq 1, \quad (1)$$

where

$$s(t) = \frac{1}{\mu} F^{-1}(t), \quad 0 \leq t \leq 1, \quad (2)$$

is the share function. It should be noted that the share function is assumed to be strictly positive for $t \in [0, 1]$, so it can be considered as a probability density function. $L(p)$ represents the income share earned by the bottom $100p$ percent of low income earners. The closeness of the Lorenz curve $y = L(p)$ to the line of perfect equality $y = p$ indicates the society's egalitarianism, and the distance between these two functions is a quantitative measure of the society's inequality. A wide family of measures of inequality is derived from the Lorenz curve. The Gini index [2] is one of the most popular measures of inequality. It is defined as twice the area between the Lorenz curve and line of perfect equality,

$$G = 2 \int_0^1 (p - L(p)) dp = 1 - 2 \int_0^1 L(p) dp, \quad (3)$$

¹The initial idea of this work came about when the first author was at the Ferdowsi University of Mashhad.

*Corresponding author

Email addresses: a.khosravi@velayat.ac.ir (A. Khosravi Tanak^a), grmohtashami@um.ac.ir (G. R. Mohtashami Borzadaran^b), ahmadi-j@um.ac.ir (Jafar Ahmadi^b)

Download English Version:

<https://daneshyari.com/en/article/7374532>

Download Persian Version:

<https://daneshyari.com/article/7374532>

[Daneshyari.com](https://daneshyari.com)