

Characterizations Based on Cumulative Residual Entropy of first Order Statistic

S. Baratpour*

*Department of Statistics, School of Mathematical Sciences
Ferdowsi University of Mashhad, P. O. Box 91775-1159
Mashhad, Iran†*

Abstract

Two different distributions may have equal cumulative residual entropy (CRE), thus a distribution can not be determined by its CRE. In this paper, we explore properties of the CRE and study conditions under which the CRE of the first order statistics can uniquely determines the parent distribution. Weibull family is characterized through ratio of the CRE of the first order statistics to its expectation. We have also some characterizations based on the CRE of residual lifetime of a series system.

Keywords. Shannon information; Cumulative Residual Entropy; Series system; Order statistics; Weibull family; residual lifetime distribution.

1 Introduction

In information theory, entropy is a measure of the uncertainty associated with a random variable. This concept was introduced by Shannon (1948). Shannon entropy represents an absolute limit on the best possible lossless compression of any communication. Shannon entropy of a discrete random variable X with possible values $\{x_1, x_2, \dots, x_n\}$ and probability mass function p is

$$H(X) = - \sum_{i=1}^n p(x_i) \log p(x_i).$$

*E-mail address: baratpur@math.um.ac.ir {S. Baratpour}.

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