Abstract

In this thesis, we examine the extropy measure of uncertainty and its properties related to ranked set sampling (RSS) and record values. Various characterizations for continuous symmetric distributions are provided using different extropies of k-record values. These include cumulative residual (past) extropy, generalized cumulative residual (past) extropy, and common Kerridge inaccuracy measures. It is shown that continuous symmetric distributions are characterized by an equality of information in upper and lower k-records using inaccuracy extropy measures. The effectiveness of the proposed test is demonstrated using three real data sets by analyzing the p-values. We define general weighted cumulative residual extropy (GWCRJ) and general weighted negative cumulative extropy (GWNCJ) and obtain simple estimators for complete and right-censored data. We present several results related to GWCRJ and GWNCJ, and propose empirical estimators for GWNCJ. GWCRJ based on first-order statistics is analyzed, and the proposed estimators are validated through data analysis. A new test of uniformity is proposed and analyzed based on GWNCJ.

This thesis introduces general weighted extropy (GWJ) and related results, including the general weighted extropy of ranked set sampling, characterization results, stochastic comparison, and monotone properties. We define GWJ for minimum and maximum ranked set samples when samples are of unequal size (minRSSU and maxRSSU, respectively). We study the stochastic comparison and monotone properties under different situations. Additionally, we compare the extropy of these two sampling data sets with that of ranked set sampling data and simple random sampling data, and obtain bounds for GWJ of minRSSU and maxRSSU. We also investigate the weighted discrimination information between simple random sampling, ranked set sampling, and minimum and maximum ranked set sampling with unequal sample sizes, and obtain some characterization results.

This thesis also introduces general weighted cumulative residual extropy (GWCRJ) and general weighted cumulative past extropy (GWCPJ). We present results related to GWCPJ and GWCRJ and consider GWCRJ-based uncertainty measures for the minRSSU, as well as GWCPJ-based uncertainty measures for the maxRSSU. Stochastic comparison for simple random sampling (SRS) is discussed. We examine the monotone properties of minRSSU and maxRSSU, as well as stochastic comparison. Empirical

estimators of GWCPJ and GWCRJ are obtained, and a simulation study is conducted to compare the proposed estimator involving the proposed ranked set sampling schemes under perfect ranking.

Keywords: Extropy, Empirical estimator, General weighted extropy, General weighted cumulative extropy, Ranked set sampling, Record values, Simple random sampling, Testing of uniformity, Testing of symmetry, Weighted extropy.