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Estimation of Entropy for Weibull Distribution Based on Doubly Censored Samples

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Abstract

Shannon (1948) defined the entropy of an continuous distribution density as

$$H(f) = -\int f(x)\log f(x)dx.$$

Vasicek (1976) proposed a entropy estimator based on spacing. The estimator is given by

$$H(m,n) = \frac{1}{n}\sum_{i=1}^{n}\log\left(\frac{n}{2m}[X_{(i+m)} - X_{(i-m)}]\right).$$

van Es (1992) introduced the entropy estimator as

$$E(m,n) = \frac{1}{n-m}\sum_{i=1}^{n-m}\log\left(\frac{(n+1)}{2m}[X_{(i+m)} - X_{(i-m)}]\right) + \sum_{k=m}^{n}\frac{1}{k} + \log\left(\frac{m}{n+1}\right).$$

Correa(1995)'s entropy estimator which modified the Vasieck's estimator is

$$C(m,n) = -\frac{1}{n}\sum_{i=1}^{n}\log\left(\frac{\sum_{j=i-m}^{i+m}(X_{(j)} - \overline{X}_{(i)})(j-i)}{\sum_{j=i-m}^{i+m}(X_{(j)} - \overline{X}_{(i)})^2}\right)$$

where $\overline{X}_{(i)} = \frac{1}{2m+1}\sum_{j=i-m}^{i+m}X_{(j)}$.

We propose some modified entropy estimators based on the doubly censored samples. We also compare the mean squared error (MSE) of the proposed estimators. In many cases, the modified van Es estimator based on the censored sample is better than the other estimators in the sense of MSE.

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