应用数学学报
Acta Mathematicae Applicatae Sinica (Chinese Series)
ISSN 0254-3079
CN 11-2040/O1

应用数学学报 » 2011, Vol. 34 » Issue (6): 961-975 DOI:

随机截尾情形下正态分布参数的最大似然估计

陈家鼎, 李东风

北京大学数学科学学院 100871

Maximum Likelihood Estmators for the Parameters of Normal Population in Randomly Censored Data

CHEN Jiading, LI Dongfeng

School of Mathematical Sciences, Peking University 100871

- 摘要
- 参考文献
- 相关文章

全文: PDF (373 KB) HTML (1 KB) 输出: BibTeX | EndNote (RIS) 背景资料

摘要 设 $x_1, \cdots, x_n, y_1, \cdots, y_n$是相互独立的随机变量, 其中 $x_1, \cdots, x_n$服从相同的正态分布 $N(\mu, \sigma^2)$或对数正态分布 $LN(\mu, \sigma^2)$, 参数 (μ, σ^2)未知. 我们的观测数据为
(t_i, δ_i), i=1, $\cdots$, n,
其中 $t_i = \min(x_1, y_1)$, $\delta_i = I(x_1 \leqslant y_1)$, 这里 $I(\cdot)$为示性函数.
基于上述数据, 本文的主要结果是论证了 (μ, σ^2)的最大似然估计 (MLE)存在的充要条件是下列条件至少一条满足:
(1)有 $t_i < t_j$使 $\delta_i = \delta_j = 1$;
(2)有 $t_i < t_j$使 $\delta_i = 1, \delta_j = 0$.
此外, 我们还给出了 MLE的计算方法和一些算例.

关键词: 正态分布 对数正态分布 截尾数据 最大似然估计

Abstract: Suppose that $x_1, \cdots, x_n, y_1, \cdots, y_n$ are independent random variables, in which $x_1, \cdots, x_n$ have the same distribution $N(\mu, \sigma^2)$ (or $LN(\mu, \sigma^2)$) with unknown parameters. The observation data is
(t_i, δ_i); i = 1, $\cdots$, n,
in which $t_i = \min(x_i, y_i)$, $\delta_i = I(x_i \leqslant y_i)$. Here $I(E)$ is the indicator of set E. In the present paper, our main result is Thereom 1. In order that there exists the maximum likelihood estimate (MLE) of (μ, σ^2) based on $\{t_i, \delta_i, i = 1, \cdots, n\}$, it is necessary and sufficient that the following condition (1) or (2) is satisfied:
(1) There exist $t_i < t_j$ such that $\delta_i = \delta_j = 1$;
(2) There exist $t_i < t_j$ such that $\delta_i = 1$; $\delta_j = 0$.
In addition, the computational algorithm for MLE and simulation examples are given.

Key words: normal distribution log-normal distribution censored data maximum likelihood estimate

收稿日期: 2010-12-13;

引用本文:

. 随机截尾情形下正态分布参数的最大似然估计[J]. 应用数学学报, 2011, 34(6): 961-975.

. Maximum Likelihood Estmators for the Parameters of Normal Population in Randomly Censored Data[J]. Acta Mathematicae Applicatae Sinica, 2011, 34(6): 961-975.

服务
把本文推荐给朋友
加入我的书架
加入引用管理器
E-mail Alert
RSS
作者相关文章

[1] Cohen A C. Truncated and Censored Samples. New York: Wiley, 1990

[2] 陈家鼎. 生存分析与可靠性. 北京: 北京大学出版社, 2005 (Chen J D. Survival Analysis and Reliability. Beijing: Peking University Press, 200

[3] 李补喜. 截尾寿命试验中参数最大似然估计的重对数率. 系统科学与数学, 1995, 15(2), 122-137 (Li B X. On the Law of the Iterated Logarithm Maximum LikelihoodEstimator Based on Mixed Censores Data. J. Systems Science and Complexity, 1995, 15(2): 122-137)

[4] 李补喜. 随机删失情形分布参数的最大似然估计的重对数率. 应用概率统计, 1995, 11(1): 60-69 (Li B X. On the Law of the Iterated Logarithm Maximum Likelihood Estimator Based on Randomly Censored Data. Chinese J. Applied Probability and Statistics, 1995, 11(1): 60-69

[5] Wang J, Chen J. On the Strong Consistency of the Maximum Likelihood Estimators from Randomly Censored Samples. Inter. J. of Re Qua. and Saf. Engin.,1997, 4(1), 35-53

[6] 随机截尾情形下Weibull分布参数的最大似然估计的相合性. 应用概率统计, 1989, 5(3): 226-233 (Chen J D. On Consistency of the Maximum Likelihood Estimator of Parameters of the Weibull Distribution from Randomly Censored Data. Chinese J. Applied Probability and Statistics, 1989, 5(3): 226-233)

[7] 国家军用标准: GJB 368.5: 维修性的试验与评定. 1987 (Chinese Military Standard GJB368.5. Experiment and Assessment of Maintainabili 1987)

[1] 董岩、李国英. 基于指数分布不同定时截尾数据的可靠度的置信下限[J]. 应用数学学报, 2006, 29(1): 61-67.

[2] 王炳兴. Weibull分布场合具有非常数形状参数恒加试验的参数估计[J]. 应用数学学报, 2004, 27(1): 44-51.

[3] 王静. 分组数据情形下对数正态分布参数的最大似然估计[J]. 应用数学学报, 2003, 26(4): 737-744.

[4] 王炳兴. 竞争失效产品加速寿命试验的统计分析[J]. 应用数学学报, 2002, 25(2): 254-262.

[5] 邓起荣. 多元回归系数的所有k-容许估计[J]. 应用数学学报, 1998, 21(4): 0-0.

[6] 胡舒合. 分布自由的回归函数核估计的相合性[J]. 应用数学学报, 1997, 20(3): 0-0.