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广义Pareto分布的广义有偏概率加权矩估计方法

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Parameter Estimation of Generalized Partial Probability Weighted Moments for the Generalized Pareto Distribution

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全文: PDF (461 KB)   HTML (1 KB)   输出: BibTeX | EndNote (RIS)   背景资料

摘要 广义Pareto分布(GPD)是统计分析中一个极为重要的分布, 被广泛应用于金融、保险、水文及气象等领域. 传统的参数估计方法如极大似然估计、矩估计及概率加权矩估计方法等已被广泛应用, 但使用中存在一定的局限性. 虽然提出很多改进方法如广义概率加权矩估计、L矩和LH矩法等, 但都是研究完全样本的估计问题, 而在水文及气象等应用领域常出现截尾样本. 本文基于概率加权矩理论, 利用截尾样本对三参数GPD提出一种应用范围广且简单易行的参数估计方法, 可有效减弱异常值的影响. 首先求解出具有较高精度的形状参数的参数估计, 其次得出位置参数及尺度参数的参数估计. 通过Monte Carlo模拟说明该方法估计精度较高.

关键词： 广义Pareto分布   广义有偏概率加权矩估计   次序统计量   截尾样本   概率加权矩估计

Abstract： The generalized Pareto distribution (GPD) is one of the most important distribution in statistics analysis that has been widely used in finance, insurance, hydrology and meteorology applications and so on. While traditional estimation methods, such as maximum likelihood (ML), methods of moments (MOM) and probability weighted moments (PWM) methods have been extensively applied, the use of these methods are often restricted. Alternative approaches (e.g., generalized probability weighted moments, L-moments and LH-moments) exist but they use complete or non-censored samples. However, censored samples are often encountered in hydrology and meteorology fields. In this article, we propose a computationally easy method from censored data for fitting the GPD, which is resistant against extremely small or large outliers, i.e., they will be robust with the lower and upper breakdown points. This method is based on probability weighted moments. Firstly, we solve shape parameter estimator which has high estimated precision, then the location and scale parameters are given for the GPD. Simulation studies show that the proposed method performs well compared to traditional techniques.

Key words： generalized Pareto distribution   generalized partial probability weighted moments   order statistics   censored samples   probability weighted moments

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