A goodness-of-fit test based on the multiplier Bootstrap technique with application to left-truncated data

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Abstract

Consider a problem of testing the hypothesis that the underlying density f belong to $\Im = \{ f_{\boldsymbol{\theta}} \mid \boldsymbol{\theta} \in \Theta \}$, where $f_{\boldsymbol{\theta}}$ is a parametric density with $\boldsymbol{\theta}$ being a p-variate vector of parameters. That is, we wish to test the null hypothesis

$$H_0 : f \in \Im \qquad \text{against} \qquad H_1 : f \notin \Im,$$

based on observations drawn from f. The goodness-of-fit tests, such as Kolmogorov-Smirnov or Cramér-von Mises statistic statistic, have been suggested with the Bootstrap approximation to the *P*-value. The Bootstrap algorithm and its sound theoretical justification are given in Stute et al. (1993 *Metrika*) and Genest & Remillard (2008 *Annal de Insti. Poincare*). After reviewing the general framework / literature of the goodness-of-fit problems, I consider the goodness-of-fit problem to a specific example for left-truncated data. Then, I introduce a computationally attractive algorithm for the goodness-of-fit test by applying the so-called "multiplier Bootstrap". It is shown that the multiplier Bootstrap method significantly reduces the computational time compared with the naïve Bootstrap method, especially under heavy truncation. We demonstrate the method by real data. The present work is to appear in *Computational Statistics & Data Analysis* (Joint work with Dr. Yoshihiko Konno, Japan Women's University).