Probability generating function based Jeffrey's divergence for statistical inference

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Abstract

Statistical inference procedures based on transforms such as characteristic function and
probability generating function have been examined by many researchers because they are much
simpler than probability density functions. Here, a probability generating function based
Jeffrey's divergence measure is proposed for parameter estimation and goodness-of-fit test.
Being a member of the M-estimators, the proposed estimator is consistent. Also, the proposed
goodness-of-fit test has good statistical power. The proposed divergence measure shows
improved performance over existing probability generating function based measures. Real data
examples are given to illustrate the proposed parameter estimation method and goodness-of-fit
test.
8. Concluding Remarks

The proposed MJD-PGF estimator showed improved performance over the MHD-PGF estimator in parameter estimation. When there is no outlier, the proposed MJD-PGF method has results generally better than the MHD and close to the ML methods. When there are outliers present, overall the MJD-PGF method performs better than MHD and ML methods in terms of biases and MSE, except for small sample sizes ($n \leq 100$). The MJD-PGF estimator is a member of the M-estimators and hence, the proposed MJD-PGF estimator is consistent. The MJD-PGF estimation method can be extended easily to the bivariate and multivariate settings, and it is computationally faster than the MD$_{12}$ estimation, which is an extension of the MHD-PGF estimation. Goodness-of-fit test using the JD-PGF measure has statistical power that is generally better than the RR and $\chi^2$ tests. Also, the JD-PGF test produces percentage of rejections close to the nominal level when samples are simulated from the null hypothesis.

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