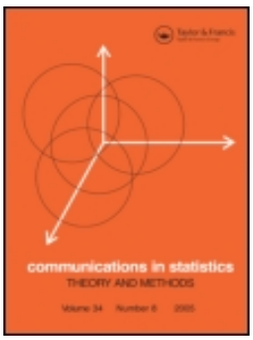

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On the Bayes estimators of the parameters of size-biased generalized power series distributions

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ABSTRACT

In this paper, we derive the Bayes estimators of functions of parameters of the size-biased generalized power series distribution under squared error loss function and weighted square error loss function. The results of size-biased GPSD are then used to obtain particular cases of the size-biased negative binomial, size-biased logarithmic series, and size-biased Poisson distributions. These estimators are better than the classical minimum variance unbiased estimators in the sense that they increase the range of the estimation. Finally, an example is provided to illustrate the results and a goodness of fit test is done using the maximum likelihood and Bayes estimators.

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Logarithmic series distribution; Negative binomial distribution; Poisson distribution; Squared error loss function; Weighted squared error loss function.

MATHEMATICS SUBJECT CLASSIFICATION
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1. Introduction

Patil (1961) defined the generalized power series distribution (GPSD) with probability mass function (p.m.f.):

$$P[X = x] = \begin{cases} \dfrac{a(x)\,\theta^x}{f(\theta)}, & \text{if} \quad x \in T \\ 0 & \text{otherwise} \end{cases} \tag{1}$$

where $\theta \geq 0$ is an unknown parameter of the distribution, $a(x) > 0$, T is a non empty countable subset of the set of non negative integers, $f(\theta) = \sum_{x \in T} a(x)\,\theta^x$, is positive, finite, and differentiable.

It can be easily seen that proper choice of T and $f(\theta)$ reduces the GPSD model (1), to the binomial, negative binomial, Poisson, and logarithmic series distributions. Patil (1962a, b) has investigated some structural properties and statistical problems associated with GPSD. Patil (1957, 1961, 1962c) has shown that for the GPSD, the maximum likelihood method and method of moments give the same estimate of the parameters of the GPSD. Patil (1963) and Patil and Joshi (1970) studied properties associated with minimum variance unbiased estimation (MVUE) for power series distributions. Eideh and Ahmad (1989) have investigated tests based on the Kullback–Leibler information measure, for a one parameter power series distribution. Hassan et al. (2006) studied the Bayesian estimation of functions of parameters of GPSD.

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