Statistics, Vol. 00, No. 0, Month 2010, 1–13

Taylor & Francis
Taylor & Francis Group

Bayesian prediction of order statistics based on k-record values from exponential distribution

Jafar Ahmadi[a]*†, S.M.T.K. MirMostafaee[a] and N. Balakrishnan[b]†

[a]*Departement of Statistics, Ordered and Spatial Data Center of Excellence, Ferdowsi University of Mashhad, P.O. Box 91775-1159, Mashhad, Iran;* [b]*Department of Mathematics and Statistics, McMaster University, Hamilton, ON, Canada L8S 4K1*

(*Received 14 March 2009; final version received 29 December 2009*)

Bayesian prediction of order statistics as well as the mean of a future sample based on observed record values from an exponential distribution are discussed. Several Bayesian prediction intervals and point predictors are derived. Finally, some numerical computations are presented for illustrating all the proposed inferential procedures.

Keywords: digamma function; highest conditional posterior density; interval prediction; order statistics; point prediction; predictive density; record values

Mathematics Subject Classification: Primary: 62G30; Secondary: 62E15

1. Introduction

Let $X_{1:n}, \ldots, X_{n:n}$ be the order statistics obtained by arranging a random sample $X_1, \ldots, X_n$ in increasing order of magnitude. These statistics have been used in a wide range of problems, including robust statistical estimation, detection of outliers, characterization of probability distributions, goodness-of-fit tests, entropy estimation, analysis of censored samples, reliability analysis, quality control, and strength of materials; for more details, see [1,2], and the references contained therein.

Let $X_1, X_2, \ldots$ be an infinite sequence of random variables. Then, an observation X_j is called an upper record value if it exceeds all previous observations, that is, if $X_j > X_i$ for every $i < j$. Similarly, upper k-record process is defined in terms of the kth largest X yet seen. For a formal definition, we consider the definition given in Arnold *et al.* [3, p. 43]: for the continuous case, let $T_{1,k} = k$, $R_{1(k)} = X_{1:k}$ and for $n \geq 2$, let $T_{n,k} = \min\{j : j > T_{n-1,k}, X_j > X_{T_{n-1,k}-k+1:T_{n-1,k}}\}$, where $X_{i:m}$ denotes the ith order statistic in a sample of size m. The sequence of upper k-records

*Corresponding author. Email: ahmadi-j@um.ac.ir
†The first and third authors are also members of the Ordered and Spatial Data Center of Excellence of Ferdowsi University of Mashhad.

ISSN 0233-1888 print/ISSN 1029-4910 online

DOI: 10.1080/02331881003599718
http://www.informaworld.com