A DUAL APPROACH TO PARAMETER ESTIMATION
Classical *vs*. Bayesian Methods in Power Rayleigh Modelling

by

Sofi MUDASIR[a], Ajaz A. BHAT[b*], Sheikh P AHMAD[a], Aasimeh REHMAN[c], Taghreed M. JAWA[d], Neveen SAYED-AHMED[d], and Ahlam H. TOLBA[e]

[a] Department of Statistics, University of Kashmir, Srinagar, India
[b] Department of Mathematical Sciences,
Islamic University of Science and Technology, Awantipora India
[c] Department of Psychology, University of Kashmir, Srinagar, India
[d] Department of Mathematics and Statistics, College of Sciences,
Taif University, Taif, Saudi Arabia
[e] Department of Mathematics, Faculty of Science,
Mansoura University, Mansoura, Egypt

Original scientific paper
https://doi.org/10.2298/TSCI2406877M

In this article, we investigated the problem of estimating the parameters of power Rayleigh distribution using a range of classical and Bayesian estimate strategies. For applied statisticians and reliability engineers, parameter estimation provides a guide for choosing the best method of estimating the model parameters. Six frequentist estimation methods, including maximum likelihood estimation, Cramer-von Mises estimation, Anderson-Darling estimation, least square estimation, weighted least square estimation, and maximum product of spacing estimation, were taken into consideration when estimating the parameters of the power Rayleigh model. The expressions for Bayes estimators of the scale parameter are derived under squared error and precautionary loss functions and utilizing extensions of Jeffrey's prior and natural conjugate priors. To investigate the finite sample properties of the parameter estimations, Monte Carlo simulations are also performed. Finally, two applications to real data are used to highlight the versatility of the suggested model and the comparison is made with the Rayleigh and some of its well-known extensions such as exponentiated Rayleigh and weighted Rayleigh distributions.

Key words: *power Rayleigh distribution, Cramer Von-Mises estimation, Anderson-Darling estimation, weighted least square estimation*

Introduction

The Rayleigh distribution (RD) initially pioneered by the physicist Lord Rayleigh [1] while researching the issue of acoustics, specifically the analysis of random vibrations. In many different domains, the RD is frequently employed to simulate specific aspects of wave phenomena, including electronic waves. It is particularly helpful for expressing a wave's amplitude when two random waves with equal powers but random phase angles are combined. The RD offers a probability distribution for the resulting wave amplitude in this situation.

* Corresponding author, e-mail: nevensayd@yahoo.com