Some Properties and Application of The Weibull-G Distribution

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Abstract

In this article, a new distribution, namely, Weibull-G distribution is defined and studied.We introduce a new generator based on the Weibull random variable called the new Weibull-G family. Various properties and a characterization of the Weibull-G family are obtained. We discuss the estimation of the model parameters by maximum likelihood and illustrate the potentiality of the extended family with applications to real data.

Keywords: Weibull distribution; Maximum likelihood estimation; Generator
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1 Introduction

Fit a suitable model to the data is the goal of many researchers. To add more flexibility to Weibull distribution, many researchers developed many generalizations of the distribution.These generalizations include the generalized Weibull distribution by Mudholkar and Kollia(1994), the exponentiated-Weibull distribution by Mudholkar et al.,(1995) . Extended Weibull Gurvich et al.,(1997) and gamma Zografos and Balakrishnan(2009) families. Consider a continuous distribution G with density g and therefore $\frac{G(x;\xi)}{1-G(x;\xi)}$ is called odds ratio. Moreover we assume that random variable X has weibull distrbution [1]. In this case, Weibull-G family distribution will be defined as follows.

Definition 1.1. We define as the cdf of the Weibull-G (Wei-G) family distribution by replacing x by $\frac{G(x;\xi)}{1-G(x;\xi)}$ in the Weibull cdf

$$F(x;\alpha,\beta,\xi)=\int_0^{\frac{G(x;\xi)}{1-G(x;\xi)}} \alpha\beta x^{\beta-1}e^{-\alpha x^{\beta}}\,dx = 1-exp\{-\alpha[\frac{G(x;\xi)}{1-G(x;\xi)}]^{\beta}\}, \qquad x\epsilon R;\alpha,\beta>0, \tag{1}$$

the pdf corresponding to (1) is given by

$$f(x;\alpha,\beta,\xi)=\ \alpha\beta g(x;\xi)\frac{G(x;\xi)^{\beta-1}}{(1-G(x;\xi))^{\beta+1}}exp\{-\alpha[\frac{G(x;\xi)}{1-G(x;\xi)}]^{\beta}\}, \qquad x>0,\alpha>0,\beta>0. \tag{2}$$

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