



The half generalized normal distribution and its properties

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Abstract

In this paper, we introduce a new distribution called as the half generalized normal distribution. This distribution contains the half normal distribution in a special case. Some mathematical properties of this distribution such as pdf, cdf, hazard rate, r th moment and the moment generating function is studied in this paper.

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1 Introduction

A random variable X is said to have the generalized normal distribution with parameters μ , σ and s if its density function is given by

$$f(x) = K \exp \left\{ - \left| \frac{x - \mu}{\sigma} \right|^s \right\}, \quad -\infty < x < \infty, -\infty < \mu < \infty, \sigma > 0, s > 0,$$

where $K = \frac{s}{2\sigma\Gamma(1/s)}$. We denote this as $X \sim GN(\mu, \sigma, s)$. The generalized normal distribution is bell-shaped and unimodal with mode at $x = \mu$. The cdf of X can be written as

$$F(x) = \begin{cases} \frac{\Gamma(1/s, ((\mu - x)/\sigma)^s)}{2\Gamma(1/s)} & \text{if } x \leq \mu \\ 1 - \frac{\Gamma(1/s, ((x - \mu)/\sigma)^s)}{2\Gamma(1/s)} & \text{if } x > \mu, \end{cases}$$

where incomplete gamma function defined by

$$\Gamma(a, x) = \int_x^\infty t^{a-1} \exp(-t) dt.$$

Nadarajah [2] introduced this distribution as the generalization of normal and Laplace distributions where $s = 2$ and $s = 1$, respectively. A generalization of the half normal distribution is studied by Cooray and Ananda [1].

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