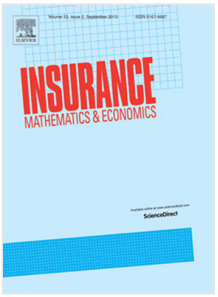

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A note on the Log–Lindley distribution

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Abstract

The Log–Lindley distribution is a continuous probability model with useful applications in insurance and inventory management. In this note, it is proven that pseudo-random data from this model can be generated by computer via the Lambert W function. It is proposed a reparametrization suitable to get estimates of the parameters. Moreover, it is showed that this reparametrization is appropriate to perform a regression analysis with dependent variable taking values in the unit interval.

Keywords: Log–Lindley distribution, Lambert W function, maximum likelihood, beta regression model.

1 Introduction

Gómez-Déniz et al. [6] introduced the Log–Lindley distribution. A random variable Y is said to have a Log–Lindley distribution if its probability density function (pdf) is

$$f(y;\sigma,\lambda)=\frac{\sigma^2}{1+\lambda\sigma}\,(\lambda-\log y)y^{\sigma-1},\qquad 0<y<1,\ \sigma>0,\ \lambda\geq 0. \tag{1}$$

The distribution defined by (1) is obtained by means of a change of variable from a two-parameter Lindley distribution defined in Shanker et al. [11] (see also Zakerzadeh and Dolati [12]). Gómez-Déniz et al. [6] studied some statistical properties of the Log–Lindley distribution as well as nice applications in insurance and inventory management. Furthermore, taking into account that this distribution has a bounded support, they gave a reparametrization of (1) to be used as a regression model for bounded responses, which provides an appealing alternative to the beta regression model.

Although in [6] the authors started the study of the Log–Lindley distribution, some inference issues still remain unsolved. In Setion 2, we derive an analytical expression for the quantile function, useful for the computer generation of pseudo-random data. In Section 3, we note that the estimation of parameters using the methods of maximum likelihood (ML) and moments (MM) may present some difficulties in practice. Motivated by this fact,

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