On the Estimation of the Parameters of the Gamma-Exponential Distribution

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A major role in applied problems solved by probability theory methods is played by the generalized gamma distribution, or Kritsky–Menkel distribution (see Kritsky and Menkel [1]), which has a density

$$f(x) = \frac{|v|x^{vq-1}e^{-(x/\theta)^v}}{\theta^{vq}\Gamma(q)}, \quad v \neq 0, \quad q > 0, \quad \theta > 0, \quad x > 0.$$

The distributions of the gamma type are exponential distribution, Erlang distribution, gamma distribution, semi-normal distribution, Rayleigh distribution, Maxwell–Boltzmann distribution, χ-distribution, Nakagami m-distribution, Weibull–Gnedenko distribution, generalized Weibull distribution, pseudo Weibull distribution, inverse Rayleigh distribution, Frechet distribution etc.

Scale mixtures of generalized gamma distributions play an important part in many applied problems in various fields of knowledge, from queuing theory to emergency management methodology (see Kudryavtsev [2]). Their main probabilistic characteristics (density, distribution function, moments) were described in Kudryavtsev [3] for the case of different signs of the distribution form parameters.

The report describes a method for estimating the parameters of a scale mixture of generalized gamma distributions which is a special case of the gamma-exponential distribution. Analytical forms of parameter estimates are given, their statistical properties are discussed, and a software package that allows automatic estimation is demonstrated.

This research is supported by Russian Foundation for Basic Research, project number 20-07-00655.

References

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