

On the duality of certain characterizations of the exponential and the geometric distributions

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Abstract:

Let $\{N(t), t > 0\}$ be a homogeneous Poisson process with parameter $\lambda=1$. Let Z be a nonnegative random variable which is distributed independently of $\{N(t), t > 0\}$ according to a mixed gamma distribution. Xekalaki and Panaretos (1988) showed that the form of F (the mixing distribution) is uniquely determined by that of the distribution of $N(Z)$. They also showed that certain characterizations of $N(Z)$ can be derived through characterizations of F . In this paper it is demonstrated that through the above mentioned results a deeper insight is gained into the relationship of the distribution duals (geometric-exponential and Yule-Pareto). Two characterization theorems are also shown for the exponential distribution which can be thought of as variants of Govindarajulu's (1966) and Crawford's (1966) characterizations of the exponential distribution as the corresponding characterizing conditions are weaker than those used by them.