

Mills Ratios of Skew-t Distribution and Their Applications

Yubo Zhang

Southwest University, Chongqing, China. zhangyuboyubosimao@163.com

Xin Liao

Southwest University, Chongqing, China. liaoixin2010@163.com

Tingting Li*

Southwest University, Chongqing, China. tinalee@swu.edu.cn

Skew distributions such as skew-normal and skew-t distributions have been widely received attentions in both theoretical and applied statistics especially in economics, insurance and finance. Empirical analysis shows that the skew-t distribution family is a reasonable alternative in modeling datasets with skewness, kurtosis and extreme tail. It is well-known in extreme value theory that the asymptotic behavior of distributional tail can determine which domain of attractions the distribution belongs to. In this paper, we consider the distributional tail behaviors of skew-t distribution and the Mills type inequality and Mills type ratio of skew-t distribution are derived. Two applications are also considered: One is to derive the asymptotic distributions of extremes of a sequence of independent and identically distributed random variables obeying the skew-t distribution, which shows that skew-t distribution belongs to the domain of attraction of Fréchet extreme value distribution, i.e., the limiting distribution of normalized skew-t extremes is Fréchet distribution. The other application is for the approximation of large quantiles of skew-t distribution by using the Mills inequalities. Numerical results are also demonstrated to study the performance of the proposed approximation of large quantiles.

Key Words: Tail behavior, extreme value distribution, large quantile.