New Classes of Distributions on $[0, \infty$

A. R. Soltani [a,b] and L. Tafakory [b]

Departments of Statistics, Kuwait University and Shiraz University

March 31, 2010

[a]Department of Statistics and Operations Research, Faculty of Science, Kuwait University, P.O. Box 5969, Safat 13060, Kuwait.

[b]Department of Statistics, Faculty of Science, Shiraz University, Shiraz 71454, Iran.

Emails: [soltani@kuc01.kuniv.edu.kw], [lalehtafakori@yahoo.com].

Abstract

The following sequence of axillary functions $\{c_n,\ n = 0, 1, 2, ..\}$ were derived by Soltani, Shirvani and Alqallaf [Statistics and Probability Letters 79 (2009) 1608-1614] in process of deriving a formula for the probability distribution function of the class of discrete random variables induced by stable law;

$$c_n(t) = \frac{\sum_{j=1}^{n+1} \binom{n+1}{j} t^{j-1} \sin(j\rho\pi)}{\sin(\rho\pi)(t^2 + 2t\cos(\rho\pi) + 1)^{n+1}} \qquad t > 0,\ 0 < \rho < 1,\ n = 0, 1, 2, ...$$

The function $c_n(t)$ appears not to be positive for every t. Nevertheless, We show that $\int_0^\infty c_n(t)dt = 1$ for every n, and then use them to introduce a fairly large class of heavy tail distributions on $[0, \infty)$. We then proceed to present formulas for their Laplace transforms and moments. We also present the connection of this class of distributions with generalized Linnik distributions.