

# A test for comparing percentile residual life functions

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## Abstract

The percentile residual life orders were introduced in Joe and Proschan (1984) and extensively studied in Franco-Pereira, Lillo, Romo, and Shaked (2009). In this paper, some interpretations and properties of these stochastic orders were given and some applications in reliability theory and finance were described.

Given the increasing interest of the percentile residual life orders in practical situations, it is convenient to develop statistical to which test, whether two independent random samples have underlying random variables which are ordered with respect to any percentile residual life order.

In this work, we present a nonparametric method for comparing percentile residual life functions. Our test is quite different from those suggested by other authors. The test proposed by Cheng (1985) to compare failure rate functions and by Joe and Proschan (1984) to compare percentile residual life functions, as well as many other tests proposed to compare functions, test that two functions are equal for all  $t$  (null hypothesis), versus the alternative that one dominates the other for all  $t$ . These models do not account for the realistic possibility that the functions cross. A test designed only to test the null hypothesis of equality may have a large probability of rejecting this null hypothesis for two populations whose functions cross. Rejection of the null hypothesis by such a test may be interpreted as evidence that one function dominates the other only if the possibility of crossing functions can be eliminated a priori. The methodology we have used combines bootstrap tools with statistical depth. Our test is defined to compare the whole functions but it may be also used to compare functions in an interval. The practical performances of our test are evaluated through simulation.