Tests for Monotonic and Nonmonotonic Trend in Time Censored Recurrent Event Data

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In recurrent event data it is often of interest to detect possible systematic changes in the pattern of events. An example is a repairable system for which it is important to detect changes in the pattern of failures. Such changes can for instance be caused by various aging effects or reliability growth. We say that there is a trend in the pattern of failures if the inter-failure times tend to alter in some systematic way, which means that the inter-failure times are not identically distributed. By using statistical trend tests it is possible to decide whether such an alteration is statistically significant or not. In general a trend in the pattern of events can be either monotonic or nonmonotonic and it is thus useful to have tests with power against both monontonic and nonmonotonic trend. We present a class of statistical tests for trend in the event times in time censored recurrent event data based on the general null hypothesis of a renewal process. This class does in particular include a test which is attractive for general use by having good power properties against both monotonic and nonmonotonic trends.

Keywords: Trend testing; Renewal process; Trend renewal process; Robust tests.