

Goodness-of-fit tests for the Weibull distribution with censored data

Florian Privé¹, Olivier Gaudoin² and Emmanuel Remy³

¹ *Laboratoire Jean Kuntzmann, Université Grenoble Alpes, France, florian.prive@ensimag.grenoble-inp.fr*

² *Laboratoire Jean Kuntzmann, Université Grenoble Alpes, France, olivier.gaudoin@imag.fr*

³ *Industrial Risk Management Department, EDF R&D, France, emmanuel.remy@edf.fr*

The (two-parameters) Weibull distribution is extensively used in reliability engineering for modelling the lifetime of ageing systems (with increasing hazard rate) as well as improving systems (with decreasing hazard rate).

Although this distribution is widely used, the checking of its relevance for a given data set is not always done, or done by elementary techniques such as Weibull plots. There exists more sophisticated techniques which aim to determine if a given model is adapted to a given data set, the goodness-of-fit (GoF) tests.

Recently, Krit et al (2014) proposed a comprehensive review and comparison of GoF tests for the Weibull distribution, for complete data sets. However, in practice, data sets are often incomplete. We will consider here the case of type II censoring, where the largest lifetimes are not observed. The problem is to determine if the Weibull distribution is a relevant model for this kind of data sets.

The aim of this paper is to present a review of GoF tests for the Weibull distribution with type II censored data sets. This review includes a state of the art of usual tests and the introduction of new tests. Other tests are built as combination of GoF tests with complementary behavior. An extensive comparison study is presented and it allows to identify the most powerful tests. Some guidance is given on the selection of the most appropriate tests based on the features of the data studied. Finally, an application to industrial data is presented.

Keywords: Reliability, Goodness-of-fit tests, Weibull distribution, Censored data
