Abstract

We propose a new reliability model, DwACM (Dichotomous-data with Auxiliary Continuous Measurements model) to describe a data set which consists of classical dichotomous response (Go or No Go) associated with a set of continuous auxiliary measurement. In this model, the lifetime of each individual is considered as a latent variable. Given the value of the latent variable, the dichotomous response is either 0 or 1 depending on if it fails or not at the measuring time. The continuous measurement can be regarded as observations of an underlying possible degradation candidate of which descending process is a function of the lifetime. Under the assumption that the failure of products is defined as the time at which the continuous measurement reaches a threshold, these two measurements can be linked in the proposed model. Statistical inference under this model are both in frequentist and Bayesian frameworks. To evaluate the continuous measurements, we provide a criterion, CCP (correct classification probability), to select the best degradation measurement. We also report our simulation studies of the performances of parameters estimators and CCP.

Key Words: bootstrap method, degradation measurement, dichotomous data, electro-explosive device, EM-algorithm, latent variables, Markov Chain Monte Carlo, reliability.