Goodness-of-fit tests for the frailty distribution in proportional hazards models with shared frailty

Prof. Dr. G. Claeskens
(KU Leuven, Belgium)

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Frailty models account for the clustering present in grouped event time data. A proportional hazards model with shared frailties expresses the hazard for each subject. Often a one-parameter gamma distribution is assumed for the frailties. The choice of a particular frailty distribution is, most of the time, based on the availability of software, rather than on the way it fits the data. In this paper we construct formal goodness-of-fit tests to test for gamma frailties. We construct a new class of frailty models that extend the gamma frailty model by using certain polynomial expansions that are orthogonal with respect to the gamma density. For this extended family we obtain an explicit expression for the marginal likelihood of the data. The order selection test is based on finding the best fitting model in such a series of expanded models. A bootstrap is used to obtain p-values for the tests.

Simulations and data examples illustrate the test's performance.

This is joint work with Candida Geerdens and Paul Janssen.