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The Exponentiated-Weibull Regression Models with a Cure Rate

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Abstract

An important but difficult problem in clinical trials is to determine the presence of cured patients when long-term survivors are observed. In this paper, the log-exponentiated-Weibull regression model is modified to allow the possibility that long term survivors can be present in the data. The modification leads to a log-exponentiated-Weibull regression model with a cure fraction, encompassing as special cases the log-exponencial regression and log-Weibull regression models with a cure rate typically used to model such data. The models attempt to estimate simultaneously the effects of explanatory variables on the acceleration/deceleration of the timing of a given event and the surviving fraction, that is, the proportion of the population for which the event never occurs. For the proposed model, we discussed inference aspects following both a classical and Bayesian approach. As a classical approach we considered maximum likelihood and jackknife methods to estimate the parameters of the proposed model, then we conducted the Bayesian approach via Markov chain Monte Carlo procedure. In addition, we applied global and local influence methodologies and conducted a study based on martingale and deviance residuals in a survival model with a cure fraction. The necessary matrices for application of the techniques were obtained by taking into account some usual perturbation in the model/data. Finally, a data set from the medical area analyzed under log-exponentiated-Weibull regression models with a cure fraction.

Keywords: Cure rate models, exponentiated-Weibull distribution, influence diagnostic, survival data.

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