Semi-parametric consistent estimators for recurrent event times models based on parametric virtual age functions

Eric Beutner[1], Laurent Bordes*[2], and Laurent Doyen[3]

[1]Department of Quantitative Economics [Maastricht] – Department of Quantitative Economics P.O.Box 616 6200 MD Maastricht The Netherlands, Pays-Bas

[2]Laboratoire de Mathématiques et de leurs Applications [Pau] (LMAP) – Université de Pau et des Pays de l'Adour, Centre National de la Recherche Scientifique : UMR5142 – Bâtiment IPRA - Université de Pau et des Pays de lÁdour Avenue de lÚniversité - BP 1155 64013 PAU CEDEX, France

[3]Laboratoire Jean Kuntzmann (LJK) – CNRS : UMR5224 – Université Grenoble Alpes 700 Avenue Centrale Campus de Saint Martin d'Hères 38401 Domaine Universitaire de Saint-Martin-d'Hères, France

Résumé

We consider a large class of semi-parametric models for recurrent events based on virtual ages. Modeling recurrent events lifetime data using virtual age models has a long history. This rich class of model contains standard model families as non-homogeneous Poisson processes and renewal processes and may include covariates or random effects (see for instance Pena (2006, *Statistical Science*) for a large overview on these models). In many non- or semi-parametric works the virtual age function is supposed to be known, this weakness can be overcome by parameterizing the virtual age function (see for instance Doyen and Gaudoin, 2004, *Reliability Engineering and System Safety*). Then the model consists of an unknown hazard rate function, the infinite-dimensional parameter of the model, and a parametrically specified virtual age (or effective) function. Recently Beutner, Bordes and Doyen (2017, *Bernoulli*) derived conditions on the family of effective age functions under which the profile likelihood inference method for the finite-dimensional parameter of the model leads to inconsistent estimates. Here we show how to overcome the failure of the profile likelihood method by smoothing the pseudo-estimator of the infinite-dimensional parameter of the model, by adapting a method proposed by Zeng and Lin (2007, *Journal of the American Statistical Association*) for the accelerated failure time model.

*Intervenant