Statistica Sinica **33** (2023), 1-20
doi:https://doi.org/10.5705/ss.202021.0051

SIEVE ESTIMATION OF A CLASS OF PARTIALLY LINEAR TRANSFORMATION MODELS WITH INTERVAL-CENSORED COMPETING RISKS DATA

Xuewen Lu[1], Yan Wang[1], Dipankar Bandyopadhyay[2] and Giorgos Bakoyannis[3]

[1] *University of Calgary,* [2] *Virginia Commonwealth University and* [3] *Indiana University, Indianapolis*

Abstract: We consider a class of partially linear transformation models with interval-censored competing risks data. Under a semiparametric generalized odds rate specification for the cause-specific cumulative incidence function, we obtain optimal estimators of the large number of parametric and nonparametric model components by maximizing the likelihood function over a joint B-spline and Bernstein polynomial spanned sieve space. Our specification considers a relatively simpler finite-dimensional parameter space, approximating the infinite-dimensional parameter space as $n \to \infty$. This allows us to study the almost sure consistency and rate of convergence for all parameters, and the asymptotic distributions and efficiency of the finite-dimensional components. We study the finite-sample performance of our method using simulation studies under a variety of scenarios. Furthermore, we illustrate our methodology by applying it to a data set on HIV-infected individuals from sub-Saharan Africa.

Key words and phrases: Bernstein polynomials, competing risks, cumulative incidence function, interval censoring, partially linear transformation model, semiparametric efficiency.

1. Introduction

In biomedical studies with time-to-event outcomes, there could be several distinct causes of failure, referred to as competing risks (Crowder (2001)). For example, when studying 137 bone marrow transplant (BMT) patients (Klein and Moeschberger (2003)), patients may relapse or die while in remission during the follow-up period. If we consider relapse to be the event of interest, then death is a competing risk/event, because it impedes the occurrence of leukemia relapse. Competing risks data are often subject to interval censoring, implying that the

Corresponding author: Xuewen Lu, Department of Mathematics & Statistics, University of Calgary, Calgary, Alberta T2N 1N4, Canada. E-mail: lux@math.ucalgary.ca.