# A Semiparametric Extended Hazard Regression Model with Time-Dependent Covariates

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## Abstract

We introduce a general class of semiparametric hazard regression models, called extended hazard (EH) models, that are designed to accommodate various survival schemes with time-dependent covariates. The EH model contains both the Cox model and the accelerated failure time (AFT) model as its subclasses so that we can use this nested structure to perform model selection between the Cox model and the AFT model. A class of estimating equations using counting process and martingale techniques is developed to estimate the regression parameters of the proposed model. The performance of the estimating procedure and the impact of model misspecification are assessed through simulation studies. Two data examples, Stanford heart transplant data and Mediterranean fruit flies, egg-laying data, are used to demonstrate the usefulness of the extended hazard model.