Approaches in modelling long term survival: models, time functions and some data

Flexible survival models are in need when modelling data from long term follow up studies. In most cases, the assumption of proportionality imposed by a Cox model will not be valid. Instead, a model that can identify time varying effects of fixed covariates should be used. Although there are several approaches that deal with this problem, it is not always straightforward how to choose which covariates should be modelled having time varying effects and which not. At the same time, it is up the researcher to define appropriate time functions that describe the dynamic pattern of the effects.

In this work we suggest a model that can deal with both fixed and time varying effects, and uses simple hypothesis tests to distinguish which covariates do have dynamic effects. The model is an extension of the parsimonious reduced rank model of rank 1. As such, the number of parameters is kept low and thus a flexible set of time functions, such as b-splines, can be used without the problem of overfitting the data. The basic theory is illustrated along with an efficient fitting algorithm. The proposed method is applied to a dataset of breast cancer patients and compared with a multivariate fractional polynomials approach for modelling time-varying effects.

Perperoglou A. Reduced rank hazard regression with fixed and time-varying effects of the covariates, Biometrical Journal, 2013; 55: 38-51
Perperoglou A. Keramopoullos A. van Houwelingen H.C. Approaches in modelling long term survival: An application to breast cancer, Statistics in Medicine, 2007;26(13): 2666-85