

Cox Proportional Hazard Model

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1 Introduction

In this note we will talk about the Cox's proportional hazards (Cox's PH) model. Suppose we observe some non-informatively right-censored data (U, δ) with covariate vector Z . That is, for subject i , the covariate vector is Z_i , survival time T_i and censoring time C_i . The observed data is (U_i, δ_i) where $U_i = \min(T_i, C_i)$ and $\delta_i = 1(T_i \leq C_i)$. Also $T_i \perp C_i | Z_i$.

And now we want to model the relationship between Z and T . One way to do that is to incorporate Z into the hazard function $h(\cdot)$, e.g.,

$$T \sim \text{Exp}(\lambda_Z) \implies h(t) = \lambda_Z \stackrel{\Delta}{=} e^{\alpha + \beta Z} = \lambda_0 e^{\beta Z},$$

where $\lambda_0 = e^\alpha$ can be viewed as a baseline hazard. If $\beta = 0$ then Z is not associated with T .

References