Group Project 1

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Design a set of distributions/models under both proportional-hazard and non-proportional-hazard assumptions

(reference link: https://spia.uga.edu/faculty_pages/rbakker/pols8501/OxfordThreeNotes.pdf)

proportional-hazard

Cox proportional hazards model

does not assume a particular baseline hazard function $h_0(t)$ but the proportional relation between groups and baseline.

$$h_i(t) = h_0(t) \exp[\beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_p X_{ip}]$$

Weibull proportional hazards model

assumes a specific functional form for the hazard rate, which can either increase or decrease over time. Its shape parameter distinctly describes whether the hazard rate is increasing, decreasing, or constant.

$$h_i(t) = \lambda\gamma t^{\gamma-1} \exp[\beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_p X_{ip}]$$

where λ is the scale parameter, and γ is the shape parameter.

non-proportional-hazard

AFT model

(https://www.jstor.org/stable/pdf/2532512.pdf)

$$\lambda(t|\theta) = \theta\lambda_0(\theta t)$$

where θ denotes the joint effect of covariates,typically $\theta = \exp(-[\beta_1 X_1 + ... + \beta_p X_p])$.