1. background information

   - $med(T_i - t_0 | T_i \geq t_0, x_{1i}) = exp(\beta_{t_0}^{(0)} + \beta_{t_0}^{(1)} x_{1i})$

   - Use Weibull distribution with survivial function $S(t) = exp\{-(\rho t)^{\kappa}\}$

   - Under $H_0 : \beta_{t_0}^{(1)} = 0$, Qth quantile residual time

$$\begin{aligned}\theta_{t_0} &= exp(\beta_{t_0}^{(0)}) = S^{-1}\{(1-Q)S(t_0)\} - t_0 \\ &= (1/\rho_0)\{log(1/1-Q) + (\rho_0 t_0)^{\kappa}\}^{1/\kappa} - t_0, t_0 \geq 0\end{aligned}$$

   - Under $H_1 : \beta_{t_0}^{(1)} \neq 0$ Qth quantile residual time

$$\begin{aligned}\theta_{t_0} &= exp(\beta_{t_0}^{(0)} + \beta_{t_0}^{(1)} x_{1i}) = S^{-1}\{(1-Q)S(t_0)\} - t_0 \\ &= (1/\rho_0)\{log(1/1-Q) + (\rho_0 t_0)^{\kappa}\}^{1/\kappa} - t_0, t_0 \geq 0\end{aligned}$$

   - Assume covariate $X \sim Bernoulli(.5)$,
     $exp(\beta_{t_0}^{(0)}) = 5, \quad exp(\beta_{t_0}^{(0)} + \beta_{t_0}^{(1)}) = 25, \quad \kappa = 5$

   - Assume $t_0 = 0$, find $\rho_0 = \{log(1/1-Q)\}^{1/\kappa}/exp(\beta_0^{(0)})$ and $\rho_1 = \{log(1/1-Q)\}^{1/\kappa}/exp(\beta_0^{(0)} + \beta_0^{(1)})$ using background previous assumption.

   - Find true parameter $\beta_{t_0}^{(0)}$, and $\beta_{t_0}^{(1)}$ for each $t_0 = 0, 1, 2, 3$
     When $\beta_{t_0}^{(1)} = 0$, $\beta_0^{(0)} = 1.61, \beta_1^{(0)} = 1.41, \beta_2^{(0)} = 1.22$ and $\beta_3^{(0)} = 1.04$.
     When $\beta_{t_0}^{(1)} \neq 0$, $\beta_{t_0}^{(0)}$ is same, and $\beta_0^{(1)} = 1.61$, $\beta_1^{(1)} = 1.77$, $\beta_2^{(1)} = 1.92$ and $\beta_3^{(1)} = 2.06$.

2. Data generation under $H_0 : \beta_{t_0}^{(1)} = 0$ with censoring rate C

   (1) Generate $T_i = (1/\rho_0)\{-log(1-u_i)\}^{1/\kappa}$, where u_i is from a uniform random variable between 0 and 1.

   (2) C_i is generated from $Unif(0, c)$ where constant c is for a certain censoring proportion.

   (3) If $T_i > C_i, \delta_i = 0$, otherwise $\delta_i = 1$.

   (4) Covariate X_i is generated from $Bernoulli(0.5)$.

3. Data generation under $H_1 : \beta_{t_0}^{(1)} =\neq$ with censoring rate C

   (1) Covariate X_i is generated from $Bernoulli(0.5)$

   (2) If $X_i = 1$, generate $T_i = (1/\rho_1)\{-log(1-u_i)\}^{1/\kappa}$, where u_i is from a uniform random variable between 0 and 1. Unless, generate $T_i = (1/\rho_0)\{-log(1-u_i)\}^{1/\kappa}$, where u_i is from a uniform random variable between 0 and 1.

   (3) C_i is generated from $Unif(0,c)$ where constant c is for a certain censoring proportion.

   (4) If $T_i > C_i, \delta_i = 0$, otherwise $\delta_i = 1$