

元器件生存时间模拟分析-代码

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1 数据模拟生成

```
set.seed(123)

alpha = matrix(c(0.001, 0.05, 0.0001, 0.08), ncol = 2, byrow = TRUE)
w = c(45, 55)
t = matrix(seq(10, 40, 10), ncol = 2, byrow = TRUE)
K = c(10, 50, 100)

lambda = function(r = 1:2, j = 1:2) {
  alpha_r0 = alpha[r, 1]
  alpha_r1 = alpha[r, 2]
  return(alpha_r0*exp(alpha_r1*w[j]))
}

p = function(i = 1:2, j = 1:2){
  lam1j = lambda(1, j) # failure due to factor 1
  lam2j = lambda(2, j) # failure due to factor 2

  p0 = exp(-(lam1j + lam2j)*t[i, j])
  p1 = (lam1j/(lam1j + lam2j))*(1 - p0)
  p2 = (lam2j/(lam1j + lam2j))*(1 - p0)

  return(c(p0, p1, p2))
}

Tmatrx1 = t(rmultinom(100, K[3], prob = p(1, 1)))
```

2 Stan代码

```
reliab = "  
data {  
  int<lower=0> n;  
  int DAT[n, 3];  
  vector[2] W;  
  vector[4] Tim;  
}  
parameters{  
  real<lower=0, upper=0.5> a10;  
  real<lower=0, upper=0.5> a11;  
  real<lower=0, upper=0.5> a20;  
  real<lower=0, upper=0.5> a21;  
}  
transformed parameters{  
  real<lower=0, upper=1> p0;  
  real<lower=0, upper=1> p1;  
  real<lower=0, upper=1> p2;  
  vector<lower=0, upper=1>[3] p;  
  
  p0 = exp(-(a10*exp(a11*W[1]) + a20*exp(a21*W[2]))*Tim[1]);  
  p1 = (a10*exp(a11*W[1]))/(a10*exp(a11*W[1]) + a20*exp(a21*W[2]))*(1 - p0);  
  p2 = 1-p0-p1;  
  p = [p0, p1, p2]';  
}  
model{  
  for (i in 1:n){  
    //target += multinomial_lpmf(DAT[i,] | p);  
    DAT[i,] ~ multinomial(p);  
    //DAT[i,] ~ multi_log(p0, p1, p2);  
  }  
  a10 ~ gamma(1, 1);  
  a11 ~ gamma(1, 1);  
  a20 ~ gamma(1, 1);  
  a21 ~ gamma(1, 1);  
}  
"
```

3 Stan抽样

```
library(rstan)
rstan_options(auto_write = TRUE)

stan_dat = list(
  n = nrow(Tmatrx1),
  DAT = Tmatrx1,
  W = w,
  Tim = seq(10, 40, 10)
)

fit <- stan(
  model_code = reliab, data = stan_dat, #init_r = 0.1, init = 0.001,
  warmup = 1000, iter = 2000, chains = 1, cores = 1, seed = 3)

summary(fit)
```