

Likelihood ratio test

2020-07-28

Parameter setting

If GEM model is true

The outcome is generated following

$$Y_k = S(\beta_k + b_k + \Gamma_k(\alpha'_k x)) + \epsilon_k, k = \{1, 2\} \text{ presents drug group and placebo group.} \quad (1)$$

The parameter settings are:

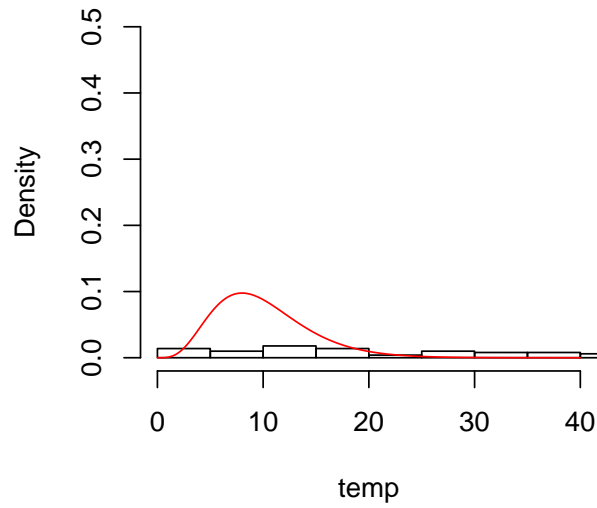
- dimension of the predictors $p = 3, 10, 20$
- $\beta_{drug} = (1, -0.5, -0.2)'; \beta_{pbo} = (1, -0.5, -0.2)'$
- $\Gamma_{drug} = (0, 1, 0)$
- $\Gamma_{pbo} = (0, 0, 1)$
- $S = [1, t, t^2]$, $t = [0, 1, 2, 3, 4, 6, 8]$ is the design matrix for fixed effect and random effect
- $x \sim MVN(\mu_x, \Sigma_x)$, $\mu_x = \mathbf{0}_p$, Σ_x has diagonal equals to 1 and 0.5 everywhere else.
- $D_{drug} = \begin{pmatrix} 0.1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0.3 \end{pmatrix}$, $D_{pbo} = \begin{pmatrix} 0.1 & 0 & 0 \\ 0 & 0.3 & 0 \\ 0 & 0 & 1 \end{pmatrix}$
- $\epsilon_{drug}, \epsilon_{pbo} \sim N(0, 1^2)$
- $\alpha_{drug} = \alpha_{pbo} = (1, \dots, p)'$

If the GEM model is not true

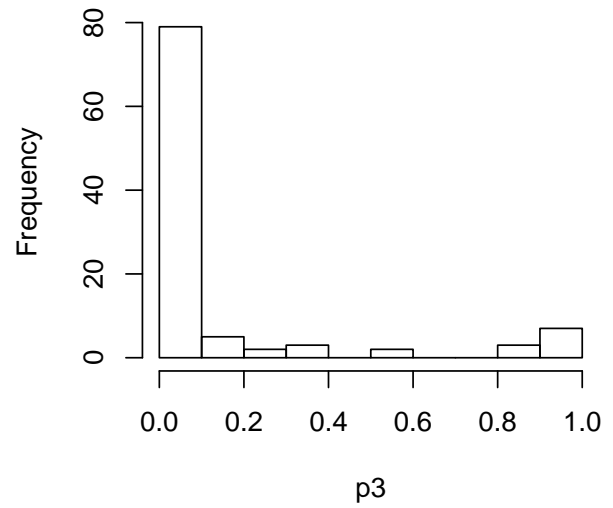
$$\text{The } \gamma_{drug} = \begin{pmatrix} -0.560 & 0.560 \\ -0.230 & 0.330 \\ 1.559 & -1.559 \end{pmatrix}, \gamma_{pbo} = \begin{pmatrix} 1.705 & 1.705 \\ -0.712 & 0.762 \\ -0.278 & 0.365 \end{pmatrix}$$

When the GEM is true

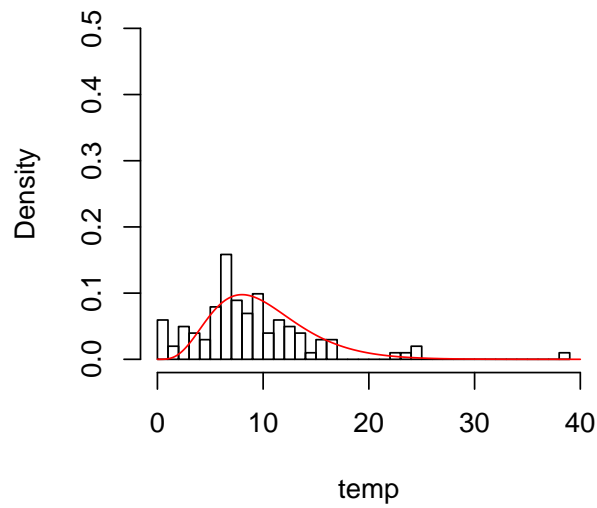
Purity: Test statistics, $p = 3$



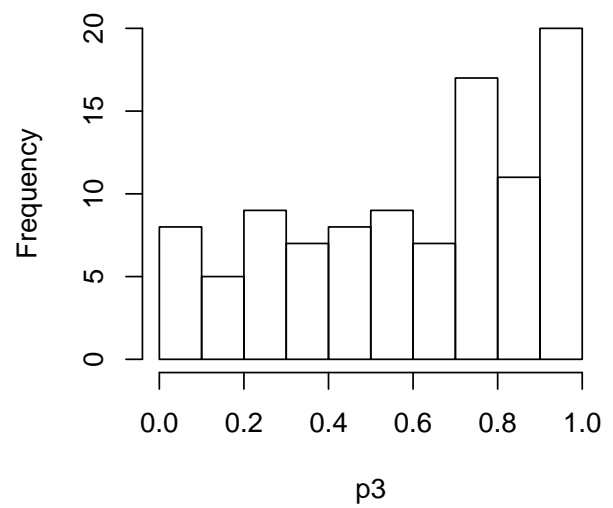
$p = 3$; $df = 10$



Likelihood: Test statistics, $p = 3$

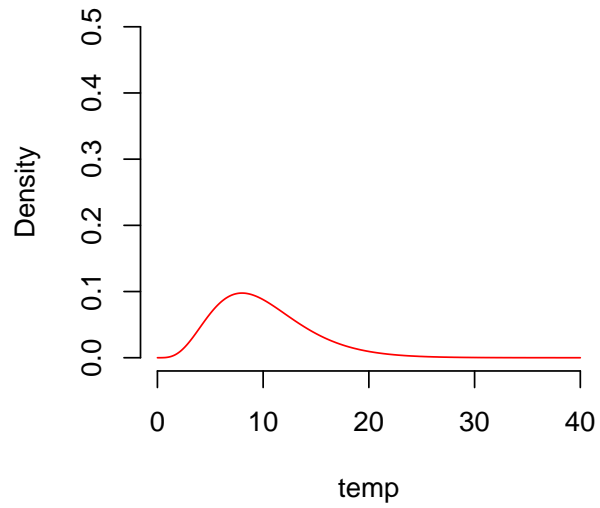


$p = 3$; $df = 10$

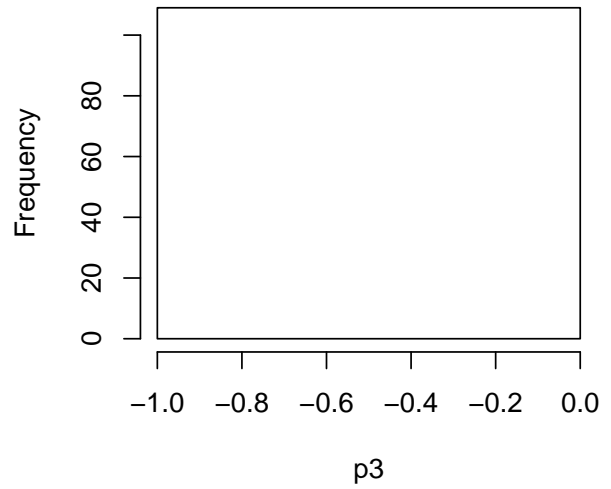


When the unrestricted model is true

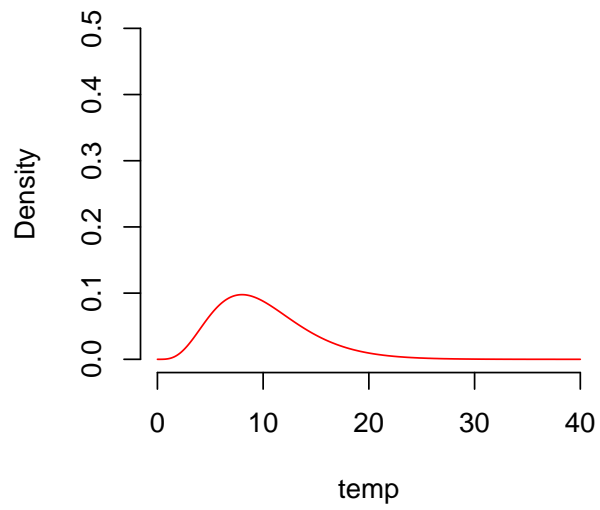
Purity: Test statistics, $p = 3$



$p = 3$; $df = 10$



Likelihood: Test statistics, $p = 3$



$p = 3$; $df = 10$

