Simulation: coefficient estimation

Simulation

The data sets are generated following the below parameter setting:

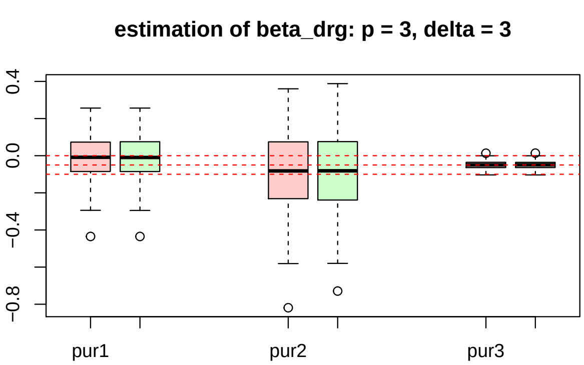
$$\mathbf{y_{ki}} = \mathbf{X_i}(\beta_\mathbf{k} + \mathbf{b_{ki}} + \mathbf{\Gamma_k}(\alpha'\mathbf{x})) + \epsilon_\mathbf{ki} \tag{1}$$

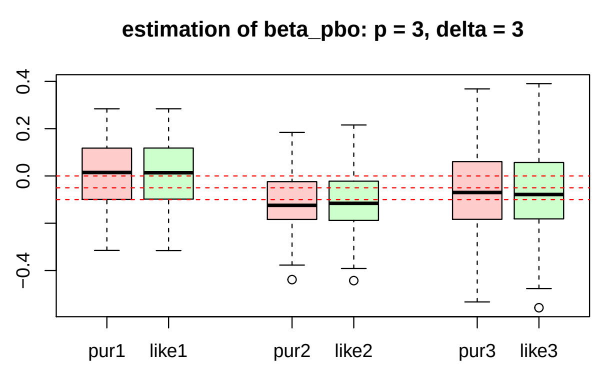
where

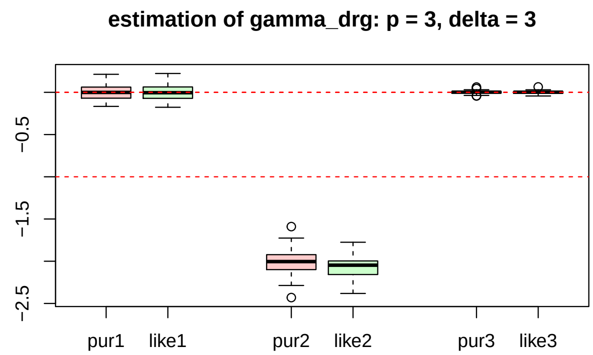
- $\alpha = \alpha_\mathbf{1} + \delta\alpha_\mathbf{2}$
  - $\alpha_1 = (1, 2, ..., p)'$;
  - $\alpha_2 = (\alpha_{21}, ..., \alpha_{2p})' \sim Exp(4)$
  - $||\alpha||_2^2 = 1$
  - when $\delta = 0$, equation (1) is a GEM model while $\delta \neq 0$, equation (1) is a non GEM model
- Suppose we have $k = \{1, 2\}$ treatments. $k = 1$ represents the placebo group while $k = 2$ represents the drug group.
- $\mathbf{X_i} = [1, t, t^2]$, and $t = [0, 1, 2, 3, 4, 6, 8]$, which is the design matrix for fixed effect and random effect
- $\beta_\mathbf{1} = \beta_\mathbf{2} = [0, -0.1, -0.05]$
- $\mathbf{\Gamma_1} = [0, 1, 0]$, $\mathbf{\Gamma_1} = [0, \cos(\pi/3), \sin(\pi/3)]$,
- $\mathbf{b_{1i}} \sim N(0, \mathbf{D_1}), \mathbf{b_{2i}} \sim N(0, \mathbf{D_2})$, $\mathbf{D_1} = \mathbf{D_2} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0.1 & 0.05 \\ 0 & 0.05 & 0.05 \end{pmatrix}$
- $\mathbf{x_i} \sim MVN(\mu_x, \Sigma_x)$, $\mu_x = \mathbf{0}_p$, Σ_x has diagonal equals to 1 and 0.5 everywhere else.
- $\epsilon_\mathbf{1}, \epsilon_\mathbf{2} \sim N(0, 1^2)$
- $p = \{3, 10\}$, which is the dimension of the predictors x_i.

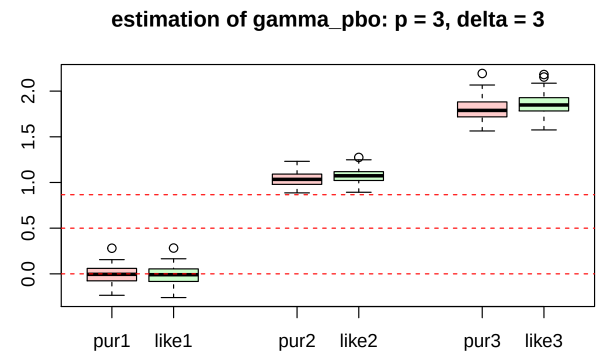
The IPWE are calculated with the estimated treatment assignment by using the purity criterion and by using the log-likelihood criterion. The proportions of correct assignment are also calculated. The whole procedures are repeated for 100 times.

Comparison of coefficient estimation: p = 3, $\delta = 0$

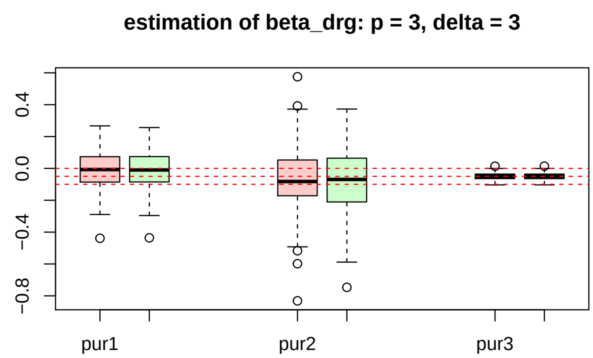


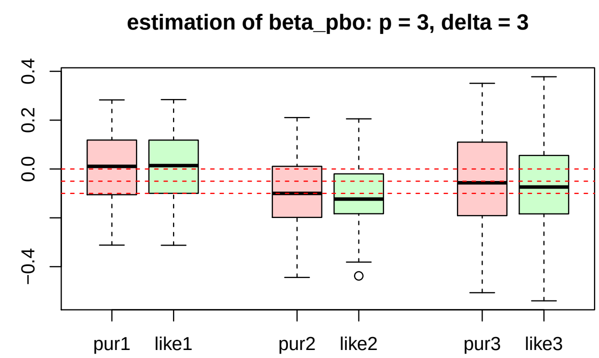


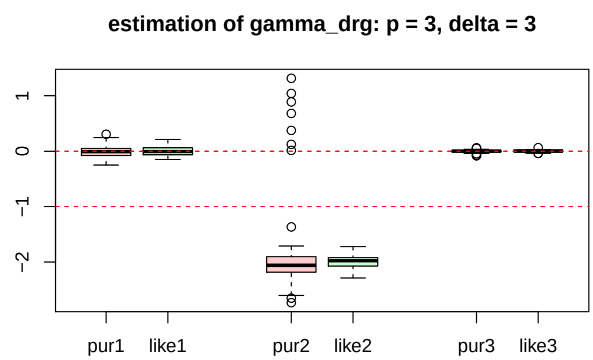


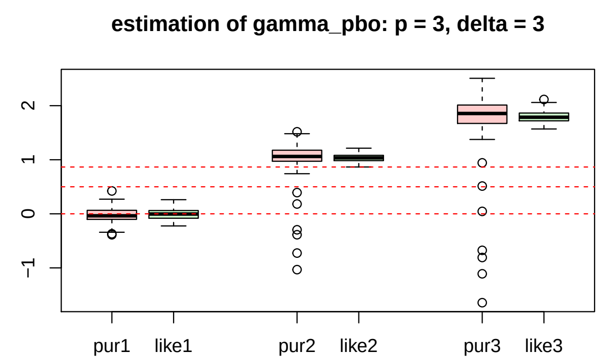


Comparison of coefficient estimation : p = 3, $\delta = 3$

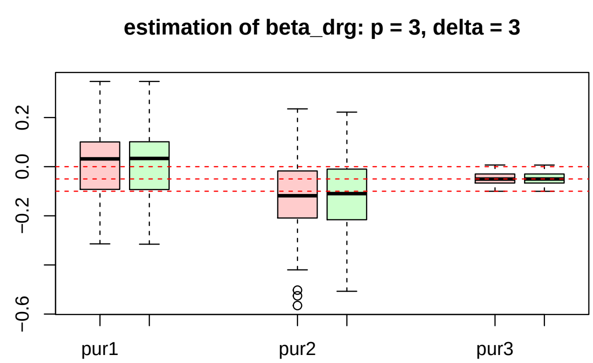


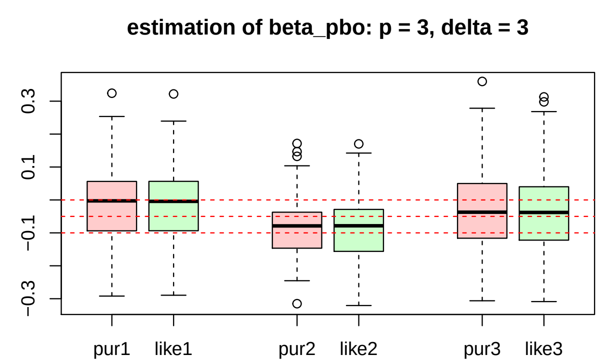


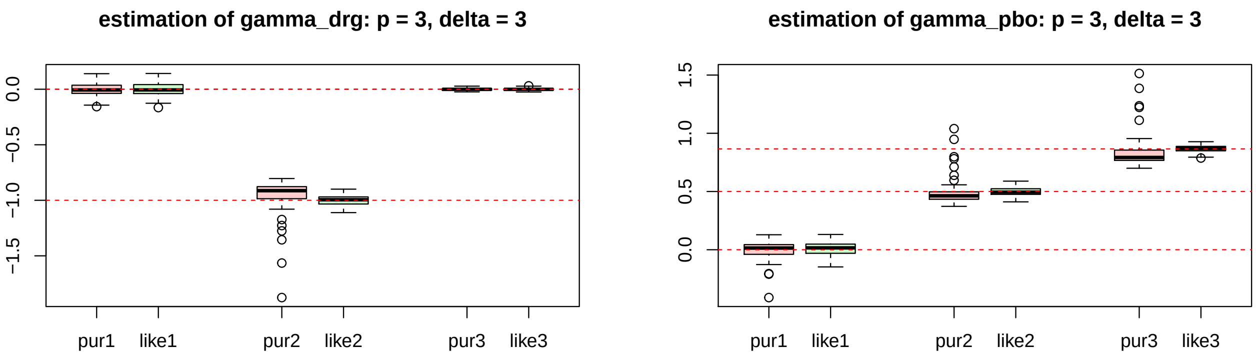




Comparison of coefficient estimation : p = 10, $\delta = 0$







Comparison of coefficient estimation : p = 10, $\delta = 3$