## set seed and path, load libraries

path<- ("c:/users/USER/jeewon")

setwd(path)

library(MASS)

library(lme4)

## load files

dat<- read.table("fixed.txt", header=T)

dat2<- read.table("ll.txt", header=T)

***####* 1. Maximal model (M1)** --- **(Wald & LRT)**

**## 1.1. bias**

~~b0 = 0 ## fixed effect magnitude (0, 1, 2)~~

b1 = 0 ## fixed effect magnitude (0, 0.2, 0.8)

**bias.max** = mean(dat$m1est)-b1 ---> m1est의 모든 값들의 평균 - b1(fixed effect)

**## 1.2. RMSE**

**rmse.max** = **sd**(dat$m1est-b1)

**## 1.3. Type 1 error rate or Power**

**### 1.3.1. Wald test**

t.max = dat$**m1**est / dat$**m1**se --> t값

wald.sig.max = ifelse(t.max>**qnorm**(.975),**1,0**)

**wald.rate.max** = mean(wald.sig.max) --> **비율** (1의 비율이 많을 수록 평균이 높음)

**### 1.3.2. LRT**

deviance.max <- -2\*(dat2$ll**.m1.null**-dat2$ll.m1)

LRT.sig.max<- ifelse(deviance.max>**qchisq**(.95,1),1,0)

LRT.rate.max = mean(LRT.sig.max)

***#### 2. Model comparison* --- (Wald & LRT)**

### **2.0. LRT** for model selection

deviance<- -2\*(dat2$ll.m1-dat2$ll.m2)

select.m1<- ifelse(deviance>qchisq(.95 ,1),1,0)

b1est.final<- ifelse(deviance>qchisq(.95 ,1), dat$m1est,dat$m2est)

b1se.final<- ifelse(deviance>qchisq(.95 ,1), dat$m1se,dat$m2se)

## **2.1. bias**

bias.MC= mean(b1est.final) - b1

## **2.2. RMSE**

rmse.MC= sd(b1est.final-b1)

## **2.3. Type 1 error rate or Power**

**### 2.3.1**. **Wald test**

t.MC=b1est.final/b1se.final

wald.sig.MC= ifelse(t.MC>qnorm(.975),1,0)

wald.rate.MC = mean(wald.sig.MC)

**### 2.3.2. LRT**

deviance.MC<- ifelse(deviance>qchisq(.95,1),

-2\*(dat2$ll.m1.null-dat2$ll.m1),

-2\*(dat2$ll.m2.null-dat2$ll.m2))

LRT.sig.MC<- ifelse(deviance.max>qchisq(.95,1),1,0)

LRT.rate.MC =mean(LRT.sig.MC)

***## summary***

table <- numeric(0)

table<- c(**bias.max**, **bias.MC**, **rmse.max**, **rmse.MC**, **wald.rate.max**, **wald.rate.MC**,

**LRT.rate.max**,**LRT.rate.MC**)

table