rm(list = ls())

betagpa <- c(0,0.75,1.5)

sig <- seq(0.01,0.05,0.01)

n <- 200

Y <- c()

no.rep <- 100

tol = 1e-4

n.max = 100

rej.rate <- matrix(NA,length(betagpa),length(sig))

rej.rate.per <- matrix(NA,length(betagpa),length(sig))

for(betaloop in 1:length(betagpa)){

pvalueglm <- c()

permutationPvalue <- c()

for(i in 1:no.rep){

set.seed(i)

gpa <- rnorm(n,3.1,0.3)

gre <- rnorm(n,580,80)

x.beta <- -6+betagpa[betaloop]\*gpa+0.005\*gre

pi.admit <- exp(x.beta)/(1+exp(x.beta))

for(j in 1:n){

Y[j] <- sample(c(0,1),1,c(1-pi.admit[j],pi.admit[j]),replace=F)

}

pvalueglm[i] <- summary(glm(Y~gpa+gre,family=binomial))$coef[2,4]

### Permutation

n.per <- 1000 # number of permutation = 1,000

pvalue.per <- c()

for(pp in 1:n.per){

Y.per <- Y[sample(1: n, n, replace=FALSE)]

pvalue.per[pp] <- summary(glm(Y.per~gpa+gre,family=binomial))$coef[2,4]

}

permutationPvalue[i] <- (sum(pvalue.per<=pvalueglm[i])+1)/(n.per+1)

}

for(k in 1:length(sig)){

rej.rate[betaloop,k] <- sum(pvalueglm<sig[k])/no.rep

rej.rate.per[betaloop,k] <- sum(permutationPvalue<sig[k])/no.rep

}

}

rej.rate

rej.rate.per

par(mfrow = c(1,2))

matplot(sig,t(rej.rate),col=c(1:length(betagpa)),pch=c(1:length(betagpa)),lty=c(1:length(betagpa)),type="b",frame=F,xlab="Significance level",ylab="Rejection rate",ylim=c(0,1),lwd=2,main="Wald test")

abline(a=0,b=1,col=8)

legend(0.03,rej.rate[1,4]+0.07,expression(paste(beta,'=0')),bty="n")

legend(0.03,rej.rate[2,4]+0.07,expression(paste(beta,'=0.25')),bty="n")

legend(0.03,rej.rate[3,4]+0.07,expression(paste(beta,'=0.5')),bty="n")

matplot(sig,t(rej.rate.per),col=c(1:length(betagpa)),pch=c(1:length(betagpa)),lty=c(1:length(betagpa)),type="b",frame=F,xlab="Significance level",ylab="Rejection rate",ylim=c(0,1),lwd=2,main="Permutation test")

abline(a=0,b=1,col=8)

legend(0.03,rej.rate.per[1,4]+0.07,expression(paste(beta,'=0')),bty="n")

legend(0.03,rej.rate.per[2,4]+0.07,expression(paste(beta,'=0.25')),bty="n")

legend(0.03,rej.rate.per[3,4]+0.07,expression(paste(beta,'=0.5')),bty="n")

> rej.rate

[,1] [,2] [,3] [,4] [,5]

[1,] 0.01 0.01 0.03 0.05 0.07

[2,] 0.14 0.19 0.21 0.22 0.24

[3,] 0.43 0.54 0.62 0.67 0.69

> rej.rate.per

[,1] [,2] [,3] [,4] [,5]

[1,] 0.01 0.03 0.03 0.06 0.07

[2,] 0.15 0.19 0.21 0.22 0.23

[3,] 0.47 0.57 0.62 0.66 0.68

