Messina E2A: Messina vs t-test

March 30, 2015

1 Preparation

```
library(plyr)
library(ggplot2)

## Loading required package:  methods

library(messina)

## Loading required package:  survival
## Loading required package:  splines

library(doMC)

## Loading required package:  foreach
## Loading required package:  iterators
## Loading required package:  parallel

paropts = list(.options.multicore = list(preschedule = FALSE))
```

```
deltaForMargin = function(margin, sigma_epsilon = 1, alpha = 0.05) margin - 2*sigma_epsilon*qnorm(alpha)
marginForDelta = function(delta, sigma_epsilon = 1, alpha = 0.05) delta + 2*sigma_epsilon*qnorm(alpha)

e2a.design = expand.grid(
        Delta = seq(0, 5, 0.25),
        sigma_epsilon = 1,
# p1 = c(0.2, 0.5),
# pm = c(0, 0.1, 0.2),
        p1 = c(0.5),
        pm = c(0),
        alpha = 0.2,
        t.alpha = 0.05,
        messina.minmarg = 1,
        messina.minsens = 0.8,
        messina.minspec = 0.8,
        n = c(25, 50, 100),
        reps = 1e3)
e2a.design$margin = marginForDelta(e2a.design$Delta, e2a.design$sigma_epsilon, alpha = e2a.design$alpha)

e2a.datafun = function(n, p1, pm, Delta, sigma_epsilon, ...)
{
        n1 = round(n*p1)
        n0 = n - n1
```

```
        y = rep(c(0, 1), c(n0, n1))
        y_exp = y
        y0x1 = sample((1:n)[y == 0], floor(sum(y == 0) * pm/2), replace = FALSE)
        y1x0 = sample((1:n)[y == 1], floor(sum(y == 1) * pm/2), replace = FALSE)
        y_exp[y0x1] = 1
        y_exp[y1x0] = 0
        x = Delta*y_exp + rnorm(n, mean = 0, sd = sigma_epsilon)

        list(x = x, y = y, y_exp = y_exp)
}

e2a.detfun = function(x, y, t.alpha, messina.minsens, messina.minspec, messina.minmarg, ...)
{
        det.t = t.test(x = x[y == 0], y = x[y == 1])$p.value < t.alpha

        x.messina = rbind(x, x)
        fit.messina = messina(x.messina, y == 1, min_sens = messina.minsens, min_spec = messina.minspec,
        det.messina = fit.messina@fits@summary$passed[1] == TRUE && fit.messina@fits@summary$margin[1] >

        c(t = det.t, m = det.messina)
}

registerDoMC(32)

set.seed(20150320)
e2a.det = mlply(e2a.design, function(Delta, sigma_epsilon, pm, p1, t.alpha, messina.minmarg, messina.min
        rowMeans(replicate(reps, { data = e2a.datafun(n, p1, pm, Delta, sigma_epsilon); e2a.detfun(data$

e2a.design = rbind(cbind(e2a.design, method = "t", detrate = simplify2array(e2a.det)[1,]), cbind(e2a.des
```

```
# ggplot(e2a.design[e2a.design$margin >= 0,], aes(x = margin, y = detrate, colour = factor(method))) + g
# ggplot(e2a.design, aes(x = margin, y = detrate, colour = factor(method))) + geom_line(lwd = 1) + xlab
# ggplot(e2a.design, aes(x = margin, y = detrate, colour = factor(method))) + geom_line(lwd = 1) + xlab
e2a.design$method = as.character(e2a.design$method)
e2a.design$method[e2a.design$method == "t"] = "t test"
e2a.design$method[e2a.design$method == "messina"] = "Messina"
e2a.design$method = as.factor(e2a.design$method)
ggplot(e2a.design[e2a.design$margin>=0,], aes(x = margin, y = detrate, colour = factor(method))) + geom_
```