0227 code

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2/27/2020

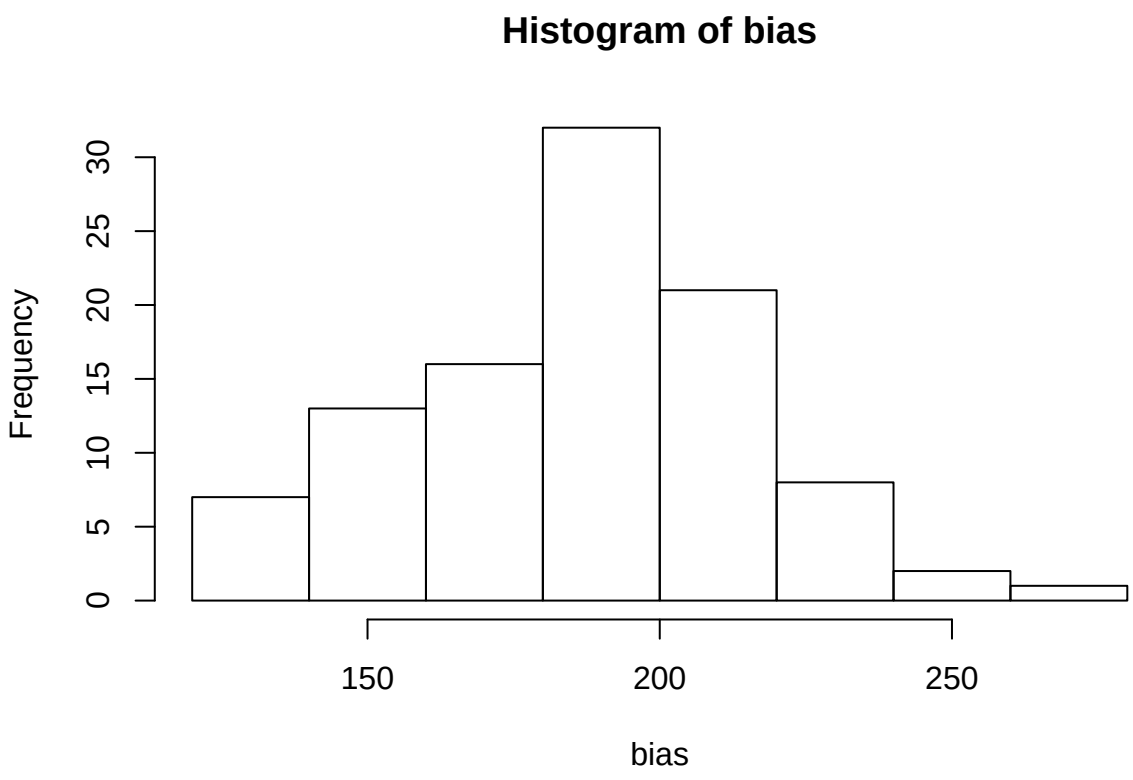
ACE calculation function

```
ht.est = function(as.hat,mn.hat,pb.hat,df,obs,n){

fit = lm(cs~as+mn+pb+age+iq+as.factor(edu)+as.factor(smoke),data = df)

as.q = quantile(as.hat,c(0.25,0.75))
mn.q = quantile(mn.hat,c(0.25,0.75))
pb.q = quantile(pb.hat,c(0.25,0.75))

as = rep(as.q[1],n)
mn = rep(mn.q[1],n)
pb = rep(pb.q[1],n)
new1 = data.frame(as,mn,pb,obs)
yhat_25 = predict(fit,new1,type = 'response')

as = rep(as.q[2],n)
mn = rep(mn.q[2],n)
pb = rep(pb.q[2],n)
new2 = data.frame(as,mn,pb,obs)
yhat_75 = predict(fit,new2,type = 'response')

ace = mean(yhat_75)-mean(yhat_25)
return(ace)
}
```

Simulation

```
n=825
#simulation = 100
nsim = 100
est.holder = rep(NA,nsim)
true.holder = rep(NA,nsim)
for(i in 1:nsim){
#confoundings
age = rnorm(825,22.9,4.2)
iq = rnorm(825,26,5)
edu = rbinom(825,1,0.24)
smoke = rbinom(825,1,0.24)

obs = data.frame(age,iq,edu,smoke)
#a
as = age^(1/2)+age*iq+edu+smoke^2+rnorm(825,0,5)
mn = age*2+edu^2+iq+smoke^3+rnorm(825,0,5)
pb = age+iq*edu+iq*smoke+smoke^2+rnorm(825,0,5)
```

```r
df = data.frame(as,mn,pb,obs)

#y
cs = 5*as+7*mn-3*pb+age*iq+edu*iq+smoke^2 +rnorm(n,sd = 35)

#true ace
true.holder[i] = 5*(quantile(as,0.75)-quantile(as,0.25))+7*(quantile(mn,0.75)-quantile(mn,0.25))-3*(qua

#propensity score
fit.as = lm(as~age+iq+as.factor(edu)+as.factor(smoke),data = df)
fit.mn = lm(mn~age+iq+as.factor(edu)+as.factor(smoke),data = df)
fit.pb = lm(pb~age+iq+as.factor(edu)+as.factor(smoke),data = df)

as.hat = predict(fit.as)
mn.hat = predict(fit.mn)
pb.hat = predict(fit.pb)

est.holder[i] = ht.est(as.hat,mn.hat,pb.hat,df = df,obs = obs,n = n)
}

bias = est.holder-true.holder
hist(bias)
```



description

```r
var(est.holder)
```

```
## [1] 3053.258
```

```
var(true.holder)
```

```
## [1] 1887.645
```

```
hist(est.holder)
```

Bootstrap

```
boots = 100
b.holder = rep(NA)
for (i in 1:boots) {

  idx = sample(1:n,size = n, replace = TRUE)
  data.b = df[idx,]
  obs.b = obs[idx,]

#propensity score
fit.as = lm(as~age+iq+as.factor(edu)+as.factor(smoke),data = data.b)
fit.mn = lm(mn~age+iq+as.factor(edu)+as.factor(smoke),data = data.b)
fit.pb = lm(pb~age+iq+as.factor(edu)+as.factor(smoke),data = data.b)

as.hat = predict(fit.as)
mn.hat = predict(fit.mn)
pb.hat = predict(fit.pb)

b.holder[i] = ht.est(as.hat,mn.hat,pb.hat,df = data.b,obs = obs.b,n = n)
}
```

```r
var(b.holder)
```

```
## [1] 126276.9
```