

Contents

1	Structural estimation	2
---	-----------------------	---

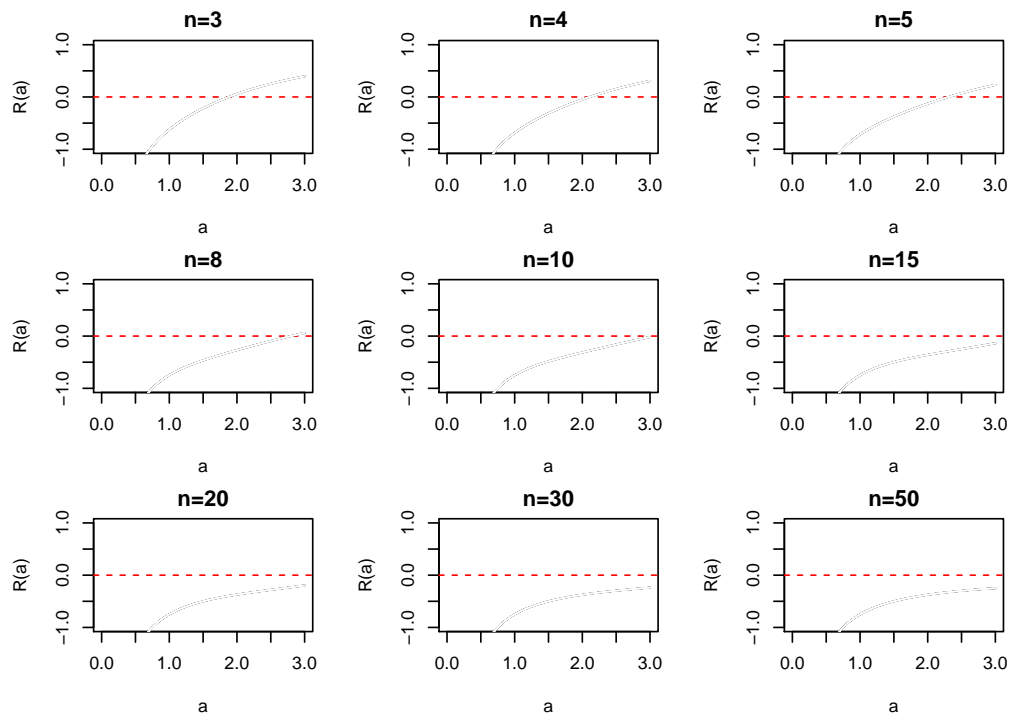
1 Structural estimation

```
load("races.RData") # Data

#####
# Simulation to gain confidence
# Parameters:
#   alpha = 1
#   c0     = 0.75
#   n      = 10
#####

p <- plnorm
r <- rlnorm
zeroprofit <- function(a, n, c0, ...) {
  p(a, ...) ^ n - c0 * a ^ (-1)
}
marginal <- function(n, cost, ...) {
  uniroot(f=zeroprofit, n=n, c0=cost, interval=c(0.0001, 10), ...)$root
}

# Plot
old.par <- par(mfrow=c(3,3), mar=c(4,4,2,2))
for (nn in c(3, 4, 5, 8, 10, 15, 20, 30, 50)) {
  curve(zeroprofit(x, n=nn, c0=0.75), from=0.001, to=3
    , main=sprintf("n=%i",nn), ylab="R(a)", xlab="a"
    , ylim=c(-1, 1))
  abline(h=0, lty=2, col=2)
  for (ss in seq(0.5, 5, length=10))
    curve(zeroprofit(x, n=nn, c0=0.75), add=TRUE, col=gray(ss/5))
}
```



```
par(old.par)
```

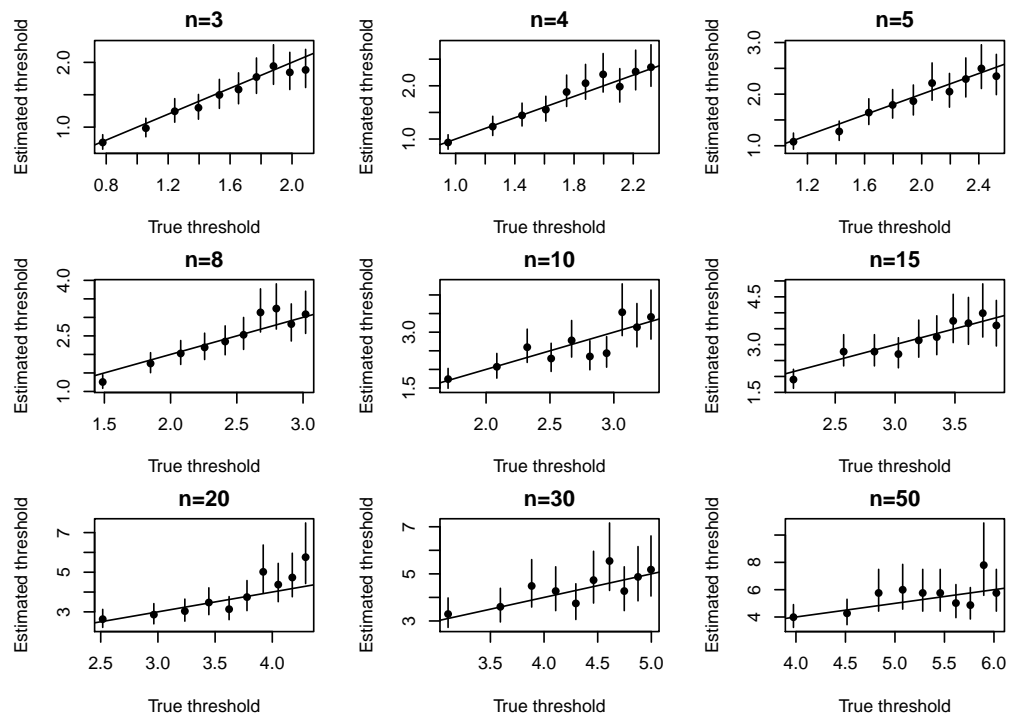
```
# Function to simulate and estimate data
estimate <- function(n, obs, n.seq) {
  costs <- seq(0.05, 0.95, length=n.seq)
  m <- matrix(ncol=4, nrow=length(costs))
  colnames(m) <- c("a", "a.hat", "a.ci95hi", "a.ci95lo")
  for (i in 1:length(costs)) {
    # Sim
    th <- marginal(n=n, cost=costs[i])
    y <- ifelse(r(obs) > th, 1, 0)
    # Fit
    fit <- glm(y ~ 1, family=binomial('probit'))
    # Save
    a.hat <- exp(-coef(fit))
```

```

    a.ci95hi <- exp(-coef(fit) + 2*coef(summary(fit))[2])
    a.ci95lo <- exp(-coef(fit) - 2*coef(summary(fit))[2])
    m[i, ] <- c(th, a.hat, a.ci95hi, a.ci95lo)
  }
  return(m)
}

# Plot
old.par <- par(mfrow=c(3,3), mar=c(4,4,2,2))
for (nn in c(3, 4, 5, 8, 10, 15, 20, 30, 50)) {
  m <- estimate(nn, 300, 10)
  plot(m, pch=16, ylim=range(m)
       , main=sprintf("n=%i",nn)
       , ylab="Estimated threshold", xlab="True threshold")
  segments(x0=m[,1], y0=m[, 3],y1=m[, 4])
  abline(a=0, b=1)
}

```



```
par(old.par)
```

```
# Analysis
```

```
entry <- ifelse(is.na(dat$nsb), 0, 1)
```

```
treatment <- dat$treatment
```

```
fit <- glm(entry ~ treatment, family=binomial('probit'))
```

```
# Baseline (race)
```

```
bhat <- coef(fit)
```

```
race <- exp(-bhat[1])
```

```
tour <- exp(-sum(bhat[-3]))
```

```
targ <- exp(-sum(bhat[-2]))
```

```
# Estimated thresholds in ability
```

```
cbind(race, tour, targ)
```

```
##               race      tour      targ
## (Intercept) 1.887531 1.552572 1.845616

# Estimated costs
zeroprofit.cost <- function(c0, n, a, ...) {
  zeroprofit(a, n, c0, ...)
}
marginal.cost <- function(n, a, ...) {
  uniroot(f=zeroprofit.cost, n=n, a=a, interval=c(0.0001, 0.999), ...)$root
}

curve(zeroprofit.cost(x, n=10, a=race)
      , xlab="Cost"
      , ylab="R(cost)")
curve(zeroprofit.cost(x, n=10, a=tour), add=TRUE, lty=2)
curve(zeroprofit.cost(x, n=10, a=targ), add=TRUE, lty=3)
abline(h=0, lty=2, col=2)
```

