

Gerber and Green (2012) Chapter 3 In-text example

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This script shows how to conduct the randomization inference procedure in Gerber and Green (2012) Chapter 3 example of 2 villages out of 7 assigned to treatment (See Section 3.4) three different ways: using the `ri2` package, using the `ri` package, and by hand with a loop.

Chapter 3 In-Text Problem (excerpts)

Suppose we wish to study the budgetary consequences of having women, rather than men, head Indian village councils, which govern rural areas in West Bengal and Rajasthan. We observe the treatment (whether the village head is a woman or not) and the outcome (what share of the budget goes to a policy issue of special importance to women). Two of the seven villages were randomly assigned to receive the treatment. For each possible randomization, we calculate the average budget allocation in the treatment and control groups, and calculate the difference in means.

```
# Data from http://isps.yale.edu/FEDAI
table_2.2 <- read.csv("datasets/GerberGreenBook_Chapter2_Table_2_2.csv")
```

In ri2

```
library(ri2)

# Declare randomization procedure
declaration <- declare_ra(N = 7, m = 2)

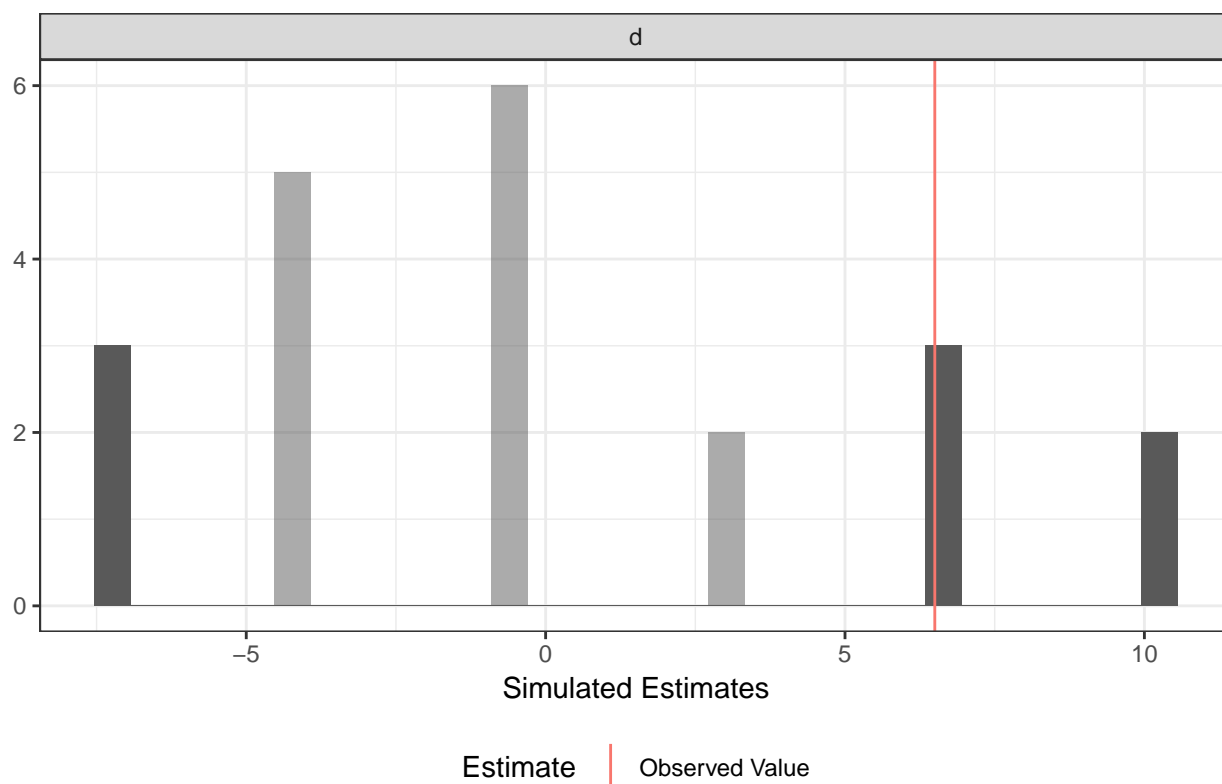
# Conduct Randomization Inference
ri2_out <- conduct_ri(y ~ d,
                      declaration = declaration,
                      assignment = "d",
                      sharp_hypothesis = 0,
                      data = table_2.2)

summary(ri2_out)

##   coefficient estimate two_tailed_p_value null_ci_lower null_ci_upper
## 1             d         6.5           0.3809524          -7.5          10

plot(ri2_out)
```

Randomization Inference



In ri

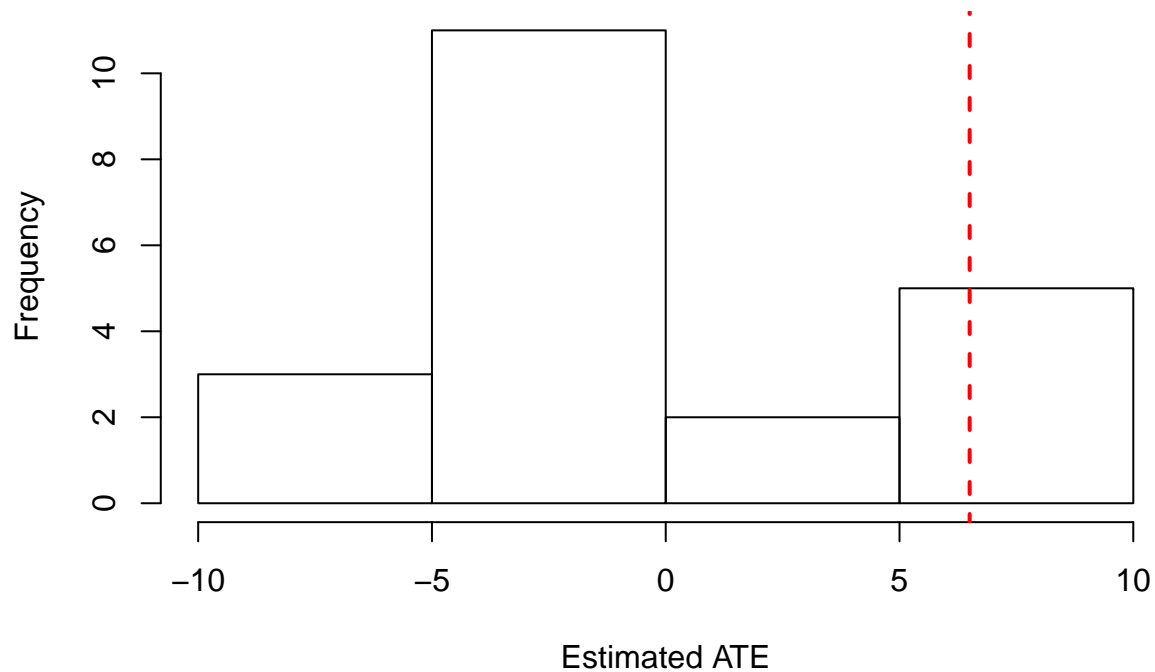
```
library(ri)

# all possible permutations
perms <- genperms(table_2.2$d)
# probability of treatment
probs <- genprobexact(table_2.2$d)
# estimate the ATE
ate <- estate(table_2.2$y, table_2.2$d, prob = probs)

## Conduct Sharp Null Hypothesis Test of Zero Effect for Each Unit

# generate potential outcomes under sharp null of no effect
Ys <- genouts(table_2.2$y, table_2.2$d, ate = 0)
# generate sampling dist. under sharp null
distout <- gendist(Ys, perms, prob = probs)
# display characteristics of sampling dist. for inference
ri_out <- dispdist(distout, ate)
```

Distribution of the Estimated ATE



```
ri_out
```

```
## $two.tailed.p.value
## [1] 0.4761905
##
## $two.tailed.p.value.abs
## [1] 0.3809524
##
## $greater.p.value
## [1] 0.2380952
##
## $lesser.p.value
## [1] 0.9047619
##
## $quantile
## 2.5% 97.5%
## -7.5 10.0
##
## $sd
## [1] 5.322906
##
## $exp.val
## [1] 0
```

By hand

```
perms <- combn(7, 2, tabulate, nbins = 7)
sims <- ncol(perms)
```

```

observed_ate <- with(table_2.2, mean(y[d == 1]) - mean(y[d == 0]))
simulated_ates <- rep(NA, sims)

for (i in 1:sims){
  table_2.2$Z_sim <- perms[,i]
  simulated_ates[i] <- with(table_2.2, mean(y[Z_sim == 1]) - mean(y[Z_sim == 0]))
}

p_two_tailed <- mean(abs(simulated_ates) >= abs(observed_ate))
p_two_tailed

## [1] 0.3809524

p_upper <- mean(simulated_ates >= observed_ate)
p_lower <- mean(simulated_ates <= observed_ate)

hist(simulated_ates, breaks = 10)

```

Histogram of simulated_ates

