

Red Team Bootstrapping

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2023-09-19

R Markdown

Import Packages

```
if (!require("boot")) install.packages("boot", dep=TRUE)
```

Loading required package: boot

```
library("boot")
```

Generate Data

```
set.seed(123)
theta = 12 # parameter for the uniform (0, theta)
dat = c(runif(100)*theta)
```

Question 1: Define function using the statistics $V = Y(1) + Y(n)$

```
V <- function(d, i) {
  d2 <- d[i]
  return(min(d2) + max(d2))
}
```

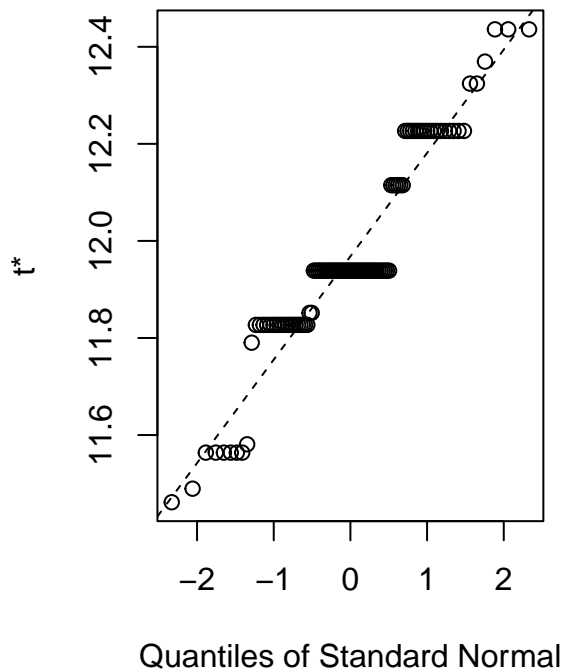
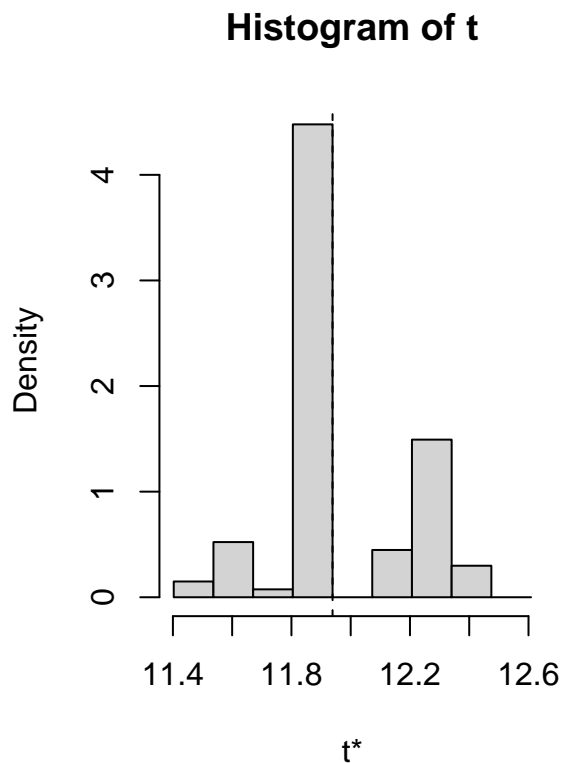
Perform Bootstrap

```
set.seed(321)
b.v <- boot(dat, V, R = 100)
b.v
```

```
##
## ORDINARY NONPARAMETRIC BOOTSTRAP
##
##
## Call:
## boot(data = dat, statistic = V, R = 100)
##
##
## Bootstrap Statistics :
##      original      bias    std. error
## t1* 11.93873 0.02951824  0.2129743
```

Plot Results

```
plot(b.v)
```



Question 2: Generate data from an exponential distribution with mean $\lambda = 8$. Perform the simulation using the bootstrap code with the statistic mean and the sample median(x).

Generate Data

```
set.seed(123)
lambda = 8
dat = c(rexp(100)*lambda)
```

Define function using the mean exponential statistic

```
fc_mean <- function(d, i){
  d2 <- d[i]
  return(mean(d2))
}
```

Perform Bootstrap

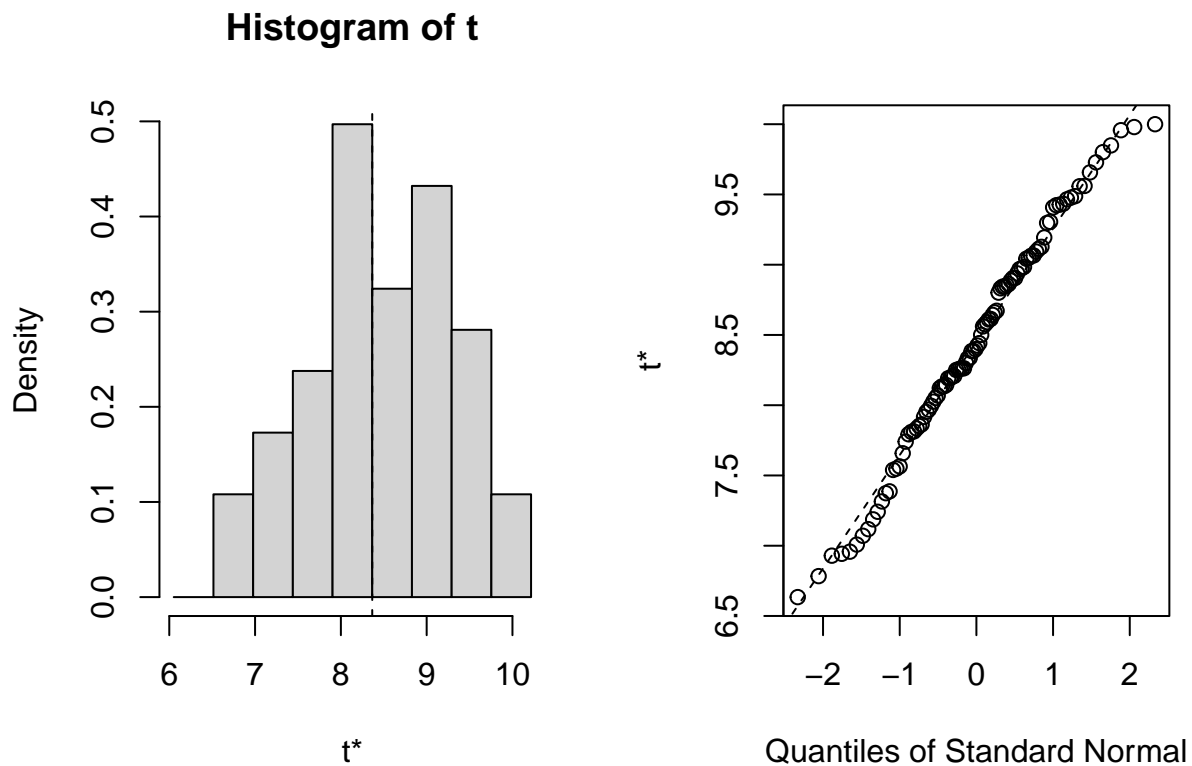
```
set.seed(321)
b.mean = boot(dat, fc_mean, R=100)
b.mean
```

```
##
## ORDINARY NONPARAMETRIC BOOTSTRAP
##
##
## Call:
## boot(data = dat, statistic = fc_mean, R = 100)
##
```

```
##
## Bootstrap Statistics :
##      original      bias    std. error
## t1*  8.36575 0.08598896  0.8065848
```

Plot Results

```
plot(b.mean)
```



Define function using median statistic

```
fc_median <- function(d, i){
  d2 <- d[i]
  return(median(d2))
}
```

Perform Bootstrap

```
set.seed(321)
b.mean = boot(dat, fc_median, R=100)
b.mean
```

```
##
## ORDINARY NONPARAMETRIC BOOTSTRAP
##
##
## Call:
## boot(data = dat, statistic = fc_median, R = 100)
##
```

```
##
## Bootstrap Statistics :
##      original      bias      std. error
## t1* 6.782032 0.1696336  0.9905104
```

Plot Results

```
plot(b.mean)
```

