

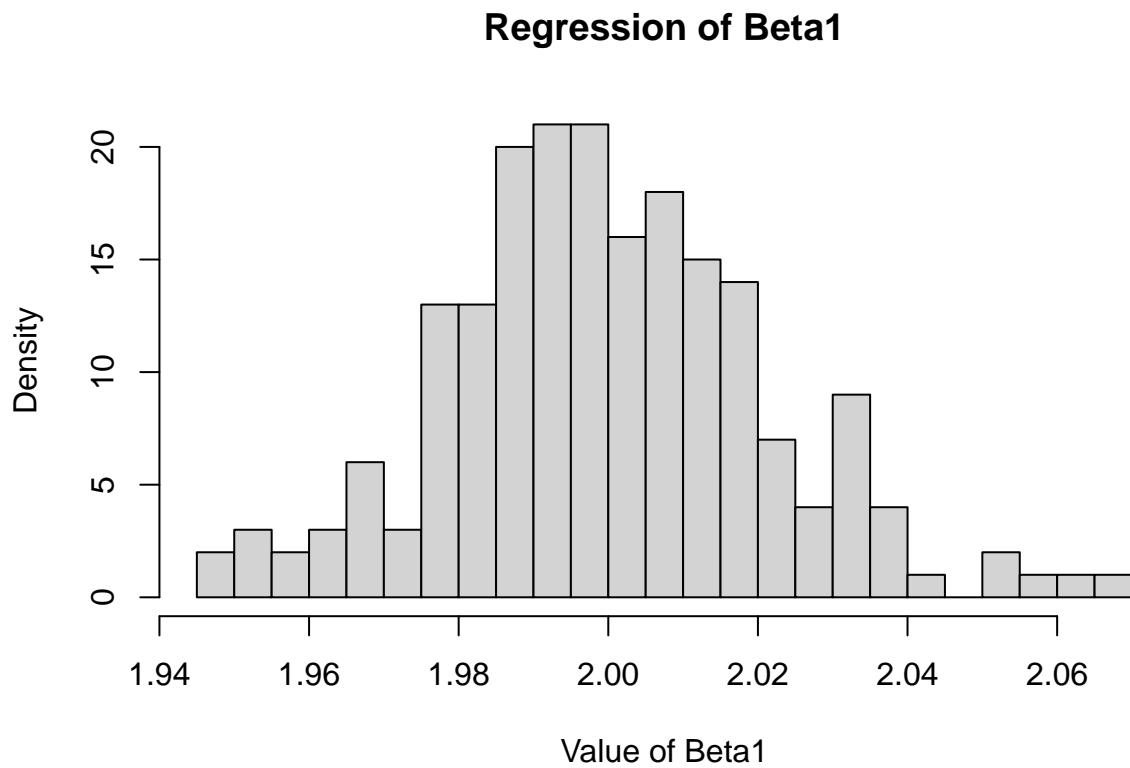
Test HW2

106033233 資工 21 周聖諺

4/3/2021

Some Essential Functions

The OLS Estimate With Bootstrap: Mean= 1.999781 Variance= 0.0004683826NULL

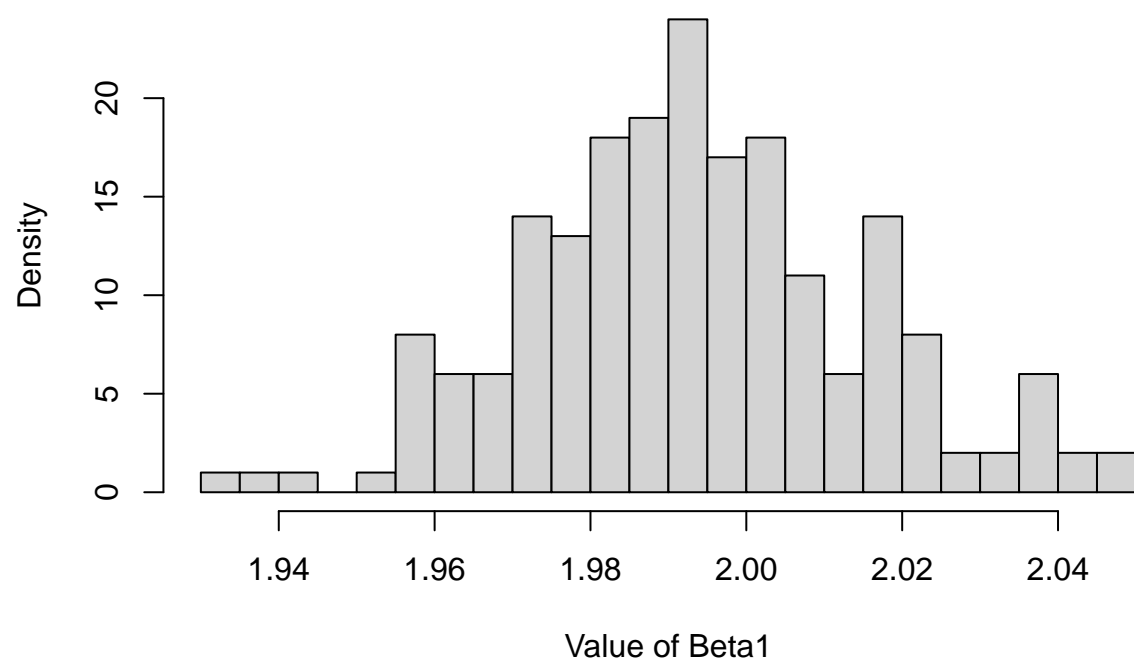


Problem 2

(d) Observation Resampling & Residual Resampling

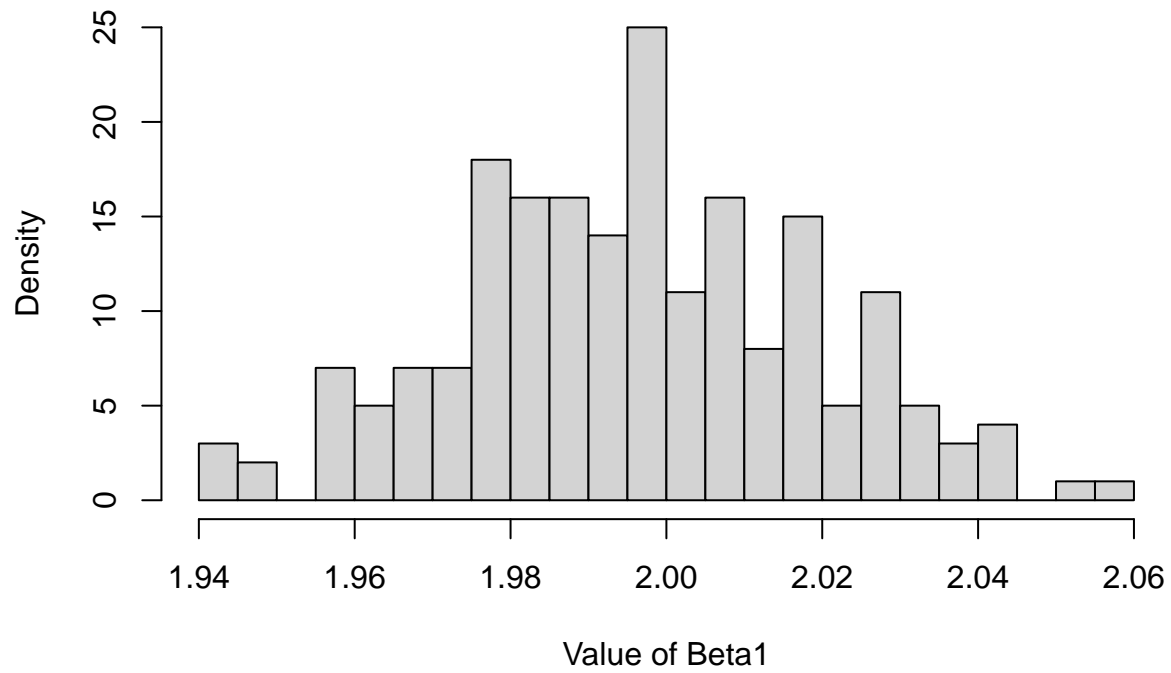
The OLS Estimate With Observation Resampling: Mean= 1.993528 Variance= 0.0004673636NULL

OLS Estimate of Beta1 With Observation Resampling



The OLS Estimate With Residual Resampling: Mean= 1.996341 Variance= 0.0005193041NULL

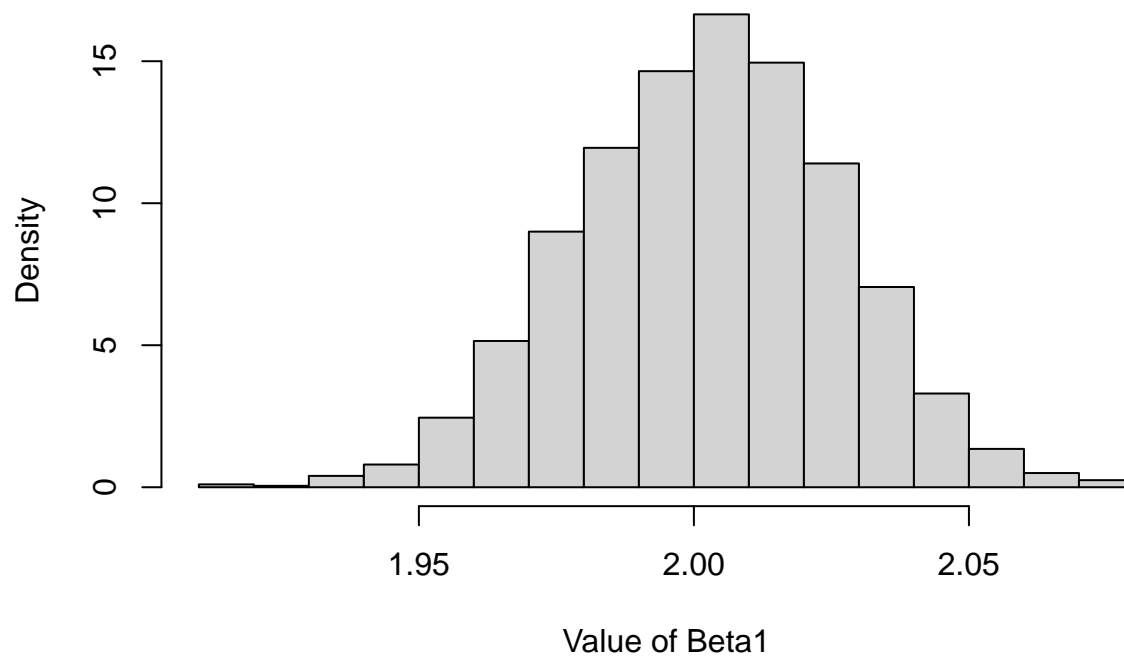
OLS Estimate of Beta1 With Residual Resampling



(e) Perturbation Bootstrap

The OLS Estimate With Perturbation Bootstrap: Mean= 2.002661 Variance= 0.0005758897NULL

OLS Estimate of Beta1 With Perturbation Bootstrap



Code

Some Essential Functions

```
# Global Variables
mean_e <- 0
sigma_e2 <- 1

mean_x <- 0
sigma_x2 <- 2

beta_0 <- 1
beta_1 <- 2

gen_y <- function(x){
  #mean_e <- 0
  #sigma_e2 <- 1
  epsilon <- rnorm(1, mean_e, sigma_e2)

  #beta_0 <- 1
  #beta_1 <- 2

  return(beta_0 + x * beta_1 + epsilon)
}
```

```

gen_ys <- function(xs){
  return(sapply(xs, gen_y))
}

inverse_v <-function(v){
  return(1/v)
}

OLS_beta_0 <- function(xs, ys){
  return(mean(ys) - OLS_beta_1(xs, ys) * mean(xs))
}

OLS_beta_1 <- function(xs, ys){
  #beta_0 <- 1
  #return(1/sum(xs * xs) * sum(xs * (ys - beta_0)))
  return(cov(xs, ys) / var(xs))
}

bootstrap_beta_1_est <- function(n){
  #mean_x <- 0
  #sigma_x2 <- 2
  xs <- rnorm(n, mean_x, sigma_x2)
  ys <- gen_ys(xs)

  return(OLS_beta_1(xs, ys))
}

bootstrap_beta_1_estimates <- function(n, m){
  ests <- rep(n, m)
  return(sapply(ests, bootstrap_beta_1_est))
}

n <- 500
m <- 200
ests <- bootstrap_beta_1_estimates(n, m)

print(cat("The OLS Estimate With Bootstrap: Mean=", mean(ests), "Variance=", var(ests)))
hist(ests, main="Regression of Beta1", xlab="Value of Beta1", breaks=20, freq = FALSE)

```