Project 1

12/13/2020

Introduction

Within the `Project1.Rmd` file and this `Project1.pdf` file, the user can create a linear regression between two variables; also, the user can use a bootstrapping function. Within the function `myslr`, the user estimates the relationship between two variables, as well show the confidence in those estimates.

Within the bootstrapping function, the user can use a limited sample to infer information about a population.

Data

Within the examples in this file, the `mtcars` dataset provides meaningful information when estimating linear regressions and bootstrapping. This dataset includes information from the 1974 *Motor Trends* US magazine, and "comprises fuel consumptions," as well as "10 apspects" of each of the thirty-two cars in the dataset. These "aspects" resemble the variables within the data.

When considering the variables in the `mtcars` dataset, it is useful to understand the types of data, which help best determine how to analyze the data. Please see the variables, their descriptions, and their data types below.

Variable Name	Variable Description	Data Type
mpg	Miles/(US) gallon	Ratio
cyl	Number of cylinders	Ratio
disp	Displacement (cu.in.)	Ratio
hp	Gross horsepower	Ratio
drat	Rear axle ratio	Ratio
wt	Weight (1000 lbs)	Ratio
qsec	1/4 mile time	Interval
vs	Engine (0 = V-shaped, 1 = straight)	Nominal
am	Transmission (0 = automatic, 1 = manual)	Nominal
gear	Number of forward gears	Ratio
carb	Number of carburetors	Ratio

Theory Used

TODO

Application of SLR to the mtcars data set

Making the SLR function: `myslr`

```r
myslr <- function(data,
                  y, yName,
                  x, xName,
                  sizeVar, sizeVarName,
                  colVar, colVarName,
                  titleVar)
{
  # Open Window to View Plot
    windows(title = "Linear Estimation Graph for Y on X")

  # Create Plot
    plot <- ggplot(
                # Data
                  data,

                # Aesthetic Mapping
                  aes(x, y,
                      color  = colVar,
                      size   = sizeVar)) +

                # Add Scatter Layer
                  geom_point(alpha = 2/5) +

                # Add Linear Estimation
                  geom_smooth(method  = "lm",
                              formula = y ~ x,
                              color   = "grey35") +

                # Titles
                  labs(title     = titleVar,
                       subtitle  = " ",
                       x         = xName,
                       y         = yName,
                       col       = colVarName,
                       size      = sizeVarName) +

                # Theme
                  theme_get()

  # show Plot
    print(plot)

  # Save plot
    ggsave(filename  = paste0(titleVar, ".png"),
           plot      = plot,
           height    = 8,
           width     = 8)
```

```r
  # Linear Estimation and Summary Output

    ## Linear Regression (returned)
      y.lm <- lm(y ~ x)

    ## Linear Regression Output (void)
      summary(y.lm)

    ## Confidence Interval at 95% (void)
      CI <- ciReg(y.lm)
      CI
      write.csv(CI, file = "Confidence Intervals.csv")

    ## Check assumptions and save .png
      png("Normal Interval Check.png", height = 300, width = 500)
      normcheck(y.lm)
      dev.off()

    ## Check residuals and save .png
      png("Fitted vs. residuals Plot.png", height = 300, width = 500)
      plot(y.lm, which = 1)
      dev.off()

    ## Linear Estimation
      return(y.lm)
  }
```

Invoke myslr function using the `mtcars` dataset

```r
  # Call Get Linear Estimation for y on x
    y.lm <- myslr(data = mtcars,
                  mtcars$mpg,   "Miles per Gallon",
                  mtcars$wt,    "Weight of Vehicle",
                  mtcars$disp,  "Displacement (cub. inches)",
                  mtcars$cyl,   "Number of Cylinders",
                  "The Relationship between MPG and Weight of Vehicle")
```

```
##             95 % C.I.lower     95 % C.I.upper
## (Intercept)      33.45050           41.11975
## x                -6.48631           -4.20263
```
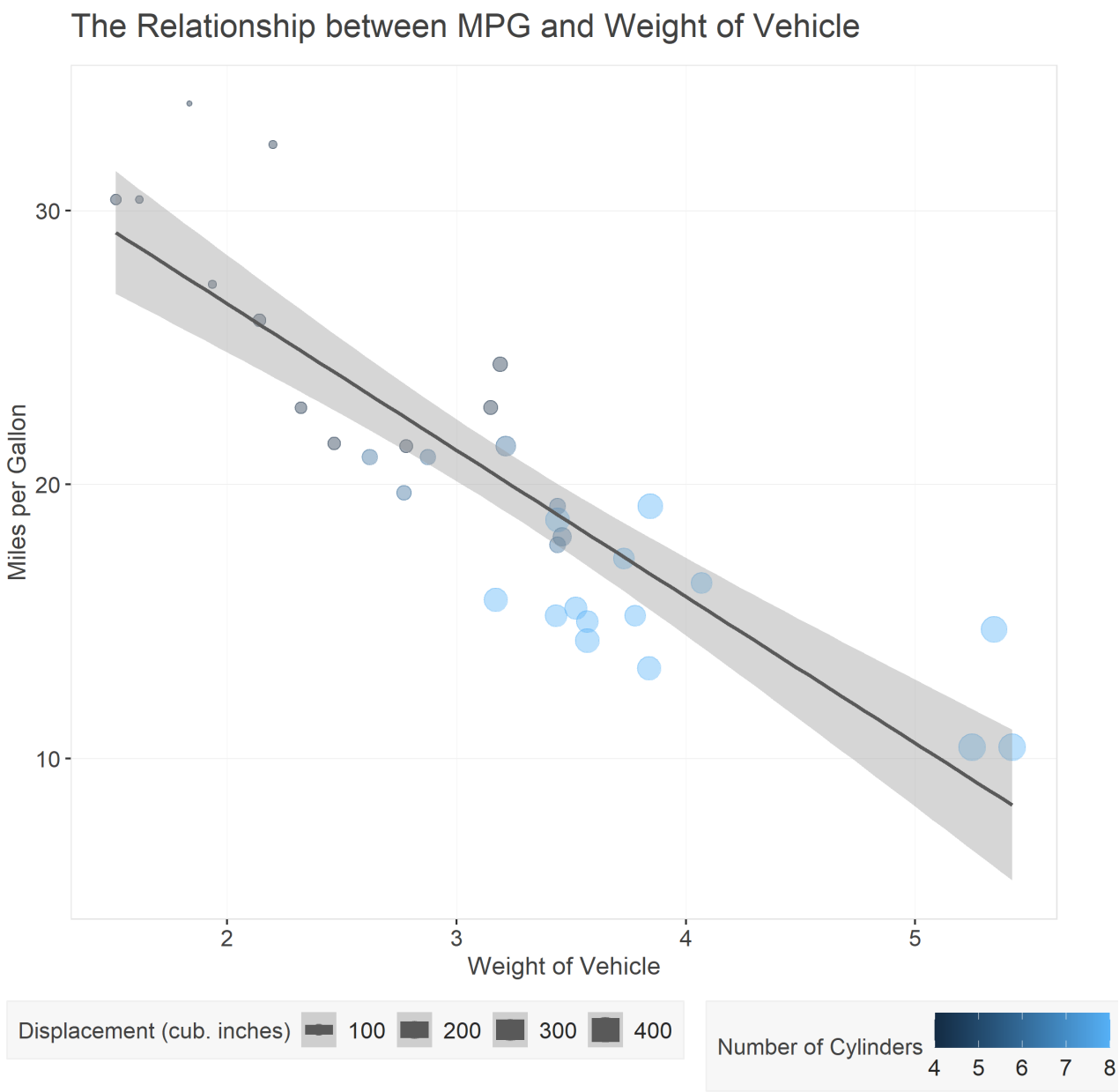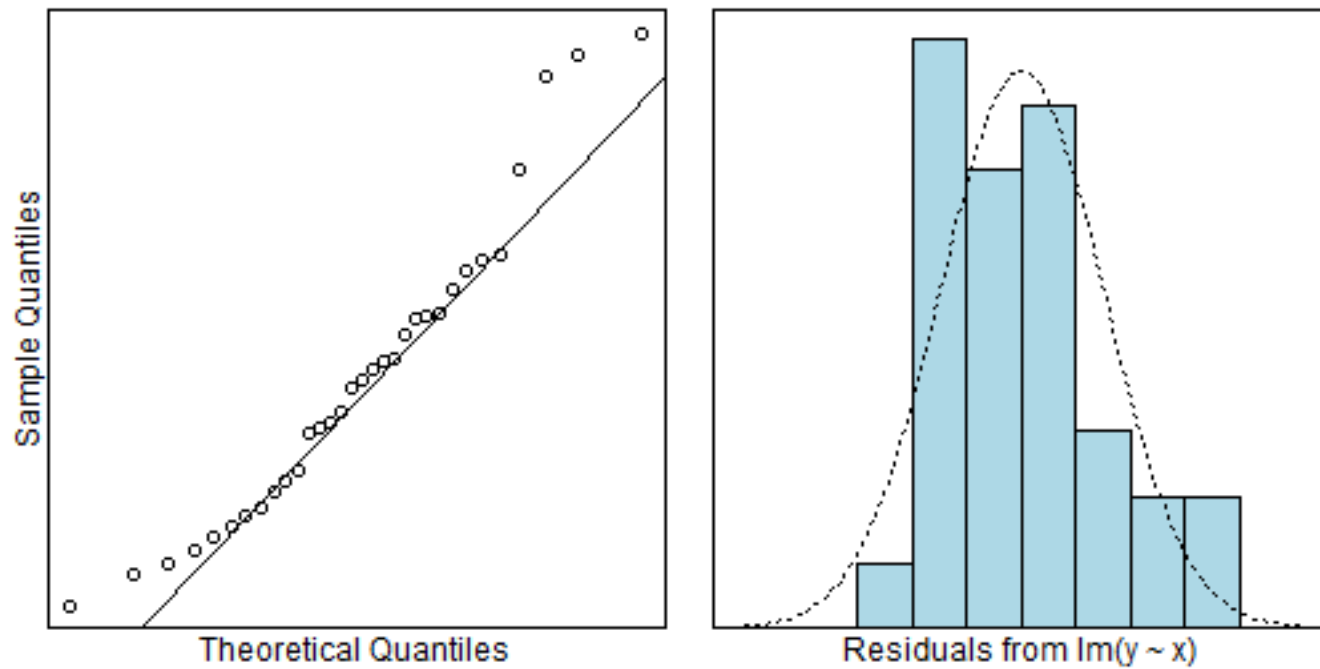
```r
  # Coefficient list
    coefsList <- y.lm$coefficients
```
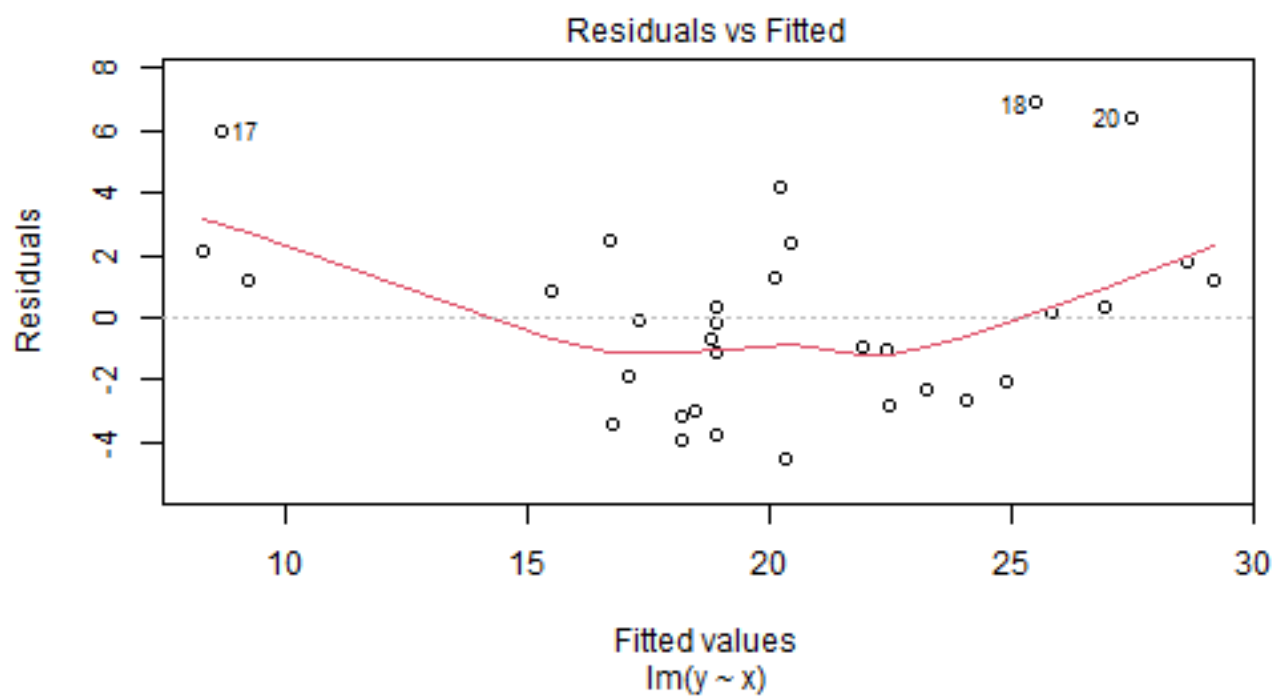
Plot Output

The Relationship between MPG and Weight of Vehicle

Normal Interval Check

Fitted vs. Residuals

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Bootstrap ==

Make Bootstrap function ———————————————————-

Bootstrap Plots ——————————————————

Commandline ——————————————————-

File ———————————————————

Invoke function on mtcars dataset ———————————————