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)
  # 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)
      ciReg(y.lm)

    ## 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)
}
```

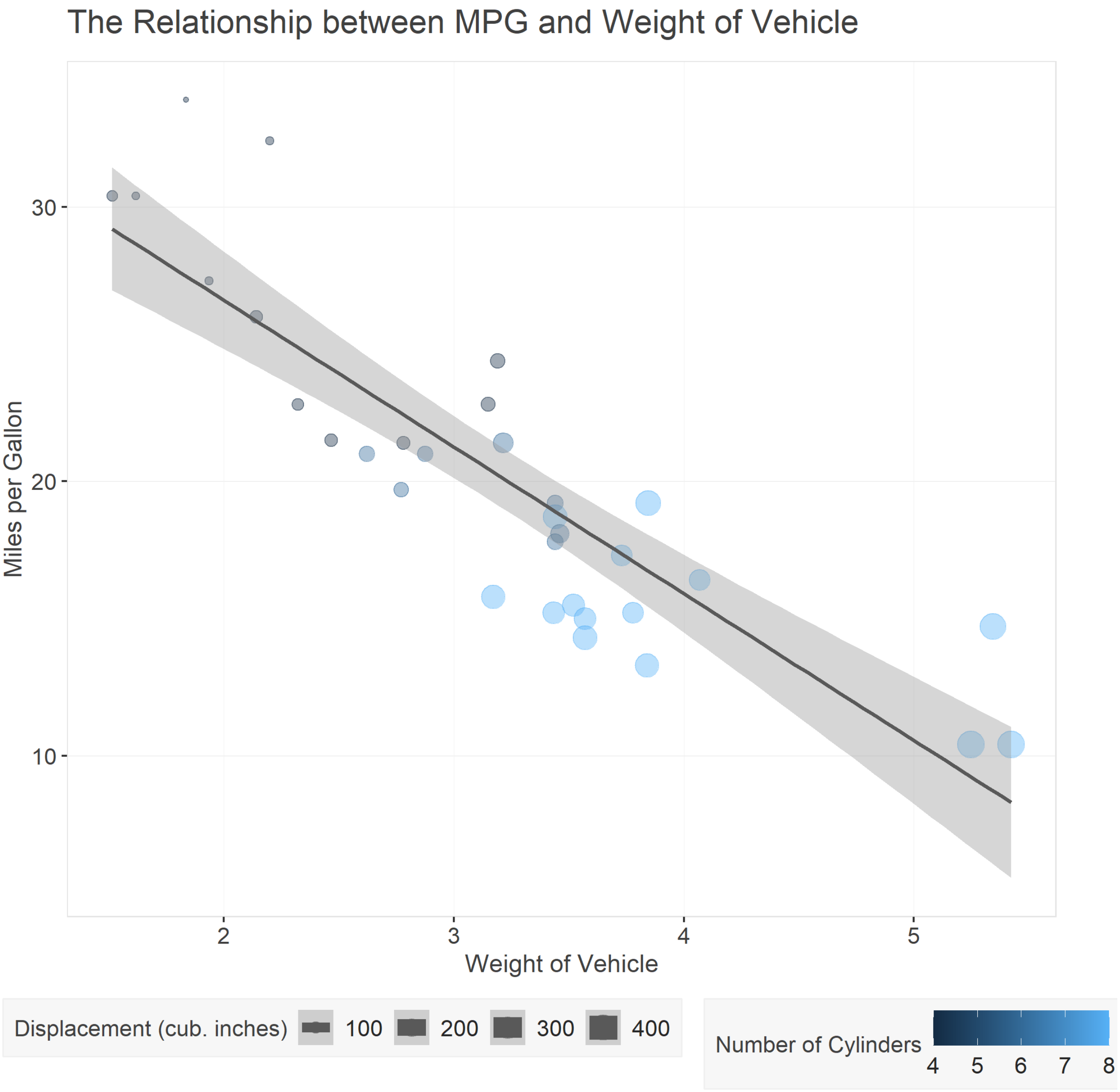
Invoke`myslr` function using the `mtcars` dataset

```
# Call Get Linear Estimation for y on x
  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
```

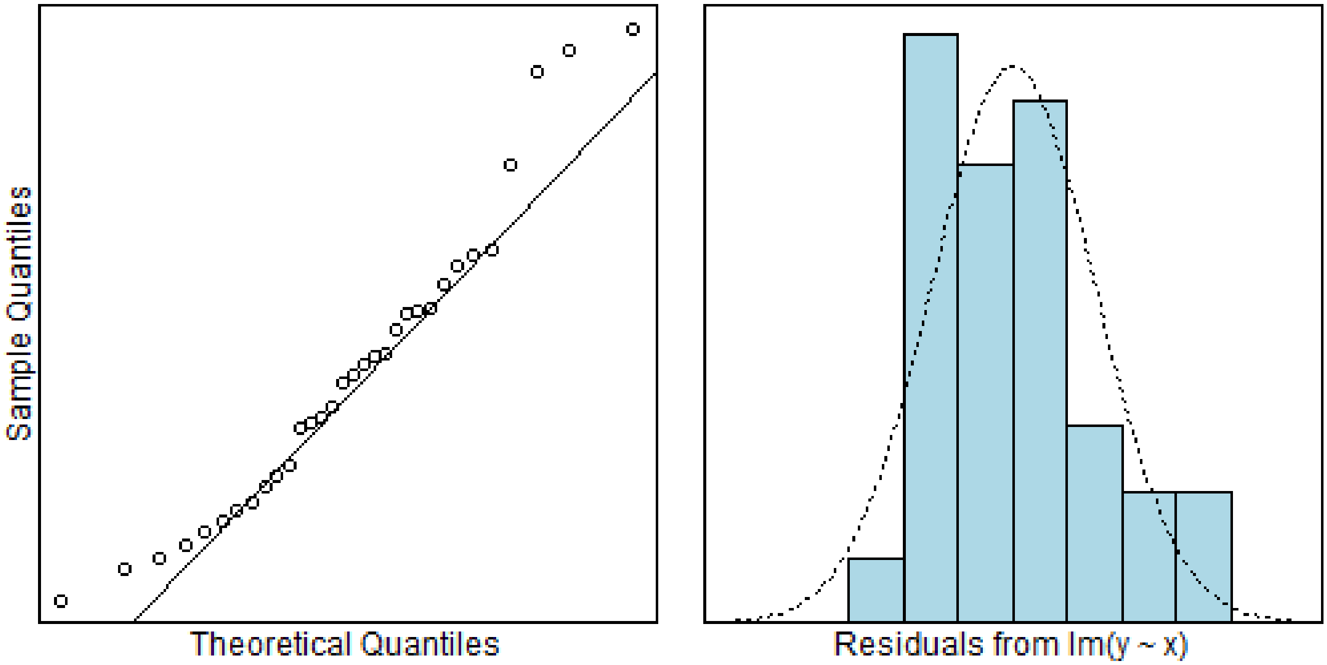
```
##
## Call:
## lm(formula = y ~ x)
##
## Coefficients:
## (Intercept)            x
##      37.285       -5.344
```

Plot Output

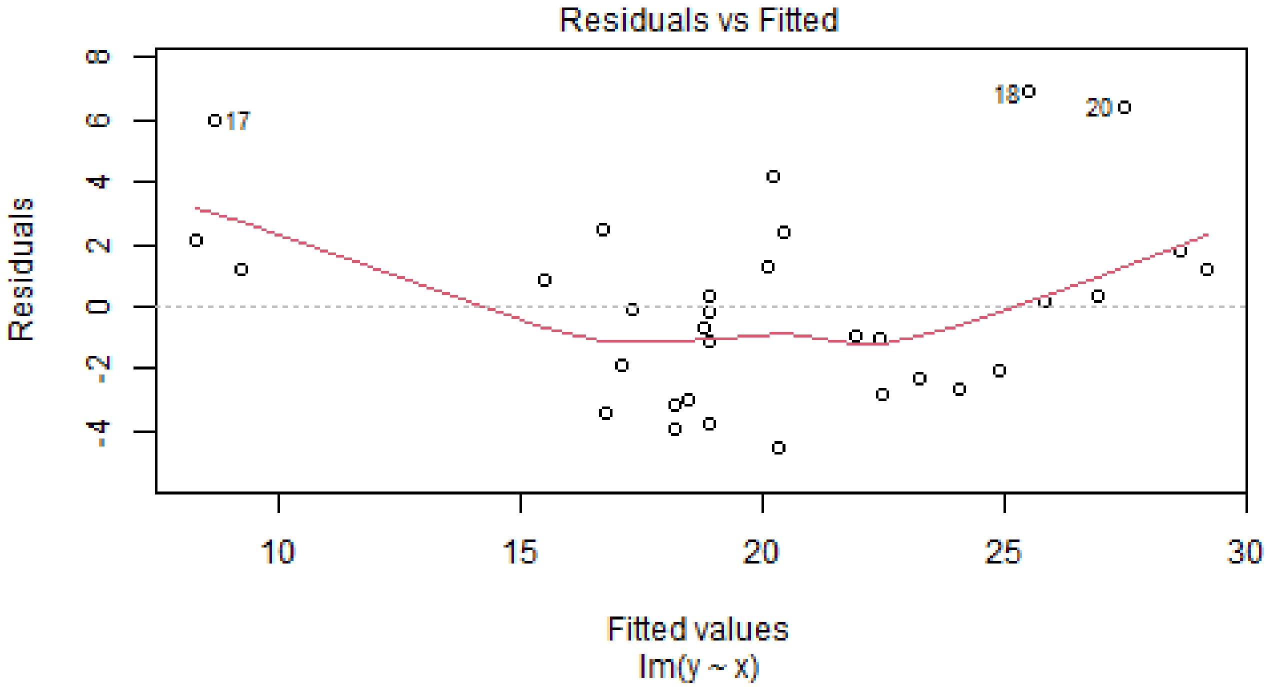


The Relationship between MPG and Weight of Vehicle
Miles per Gallon
30
20
10
2
3
4
5
Weight of Vehicle
Displacement (cub. inches)
100
200
300
400
Number of Cylinders
4
5
6
7
8

Normal Interval Check



Fitted vs. Residuals



Bootstrap ==================================

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

Bootstrap Plots —————————————————————————————

Commandline ——————————————————————————————-

File ——————————————————————————————————

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