R project: SLR and Bootstrap

Your Name

Date

Contents

This paragraph will explain what is needed to complete the project and will need to be deleted before submission

1) Use this document to build your project
2) The headings can be kept but the descriptions under will need to be changed by you. They let you know what is needed
3) All R must go into code R Cunks
4) If you need to place a picture use `![](filename){width=60%}`
5) Mathematical annotation needs to placed into Latex
6) R RStudio, Latex should already be installed.
7) You will need at least the following packages in R - s20x, ggplot2
8) The project is due on the last week of class - Friday.
9) Use subheadings as needed
10) Once finished with the supplied R chunks take off the `eval=FALSE` to see your function run.

Introduction:

What problem do you wish to solve with `myslr()`? – you will need to make a function that creates estimates for the betas in a slr. The function will take an x vector and a y vector.

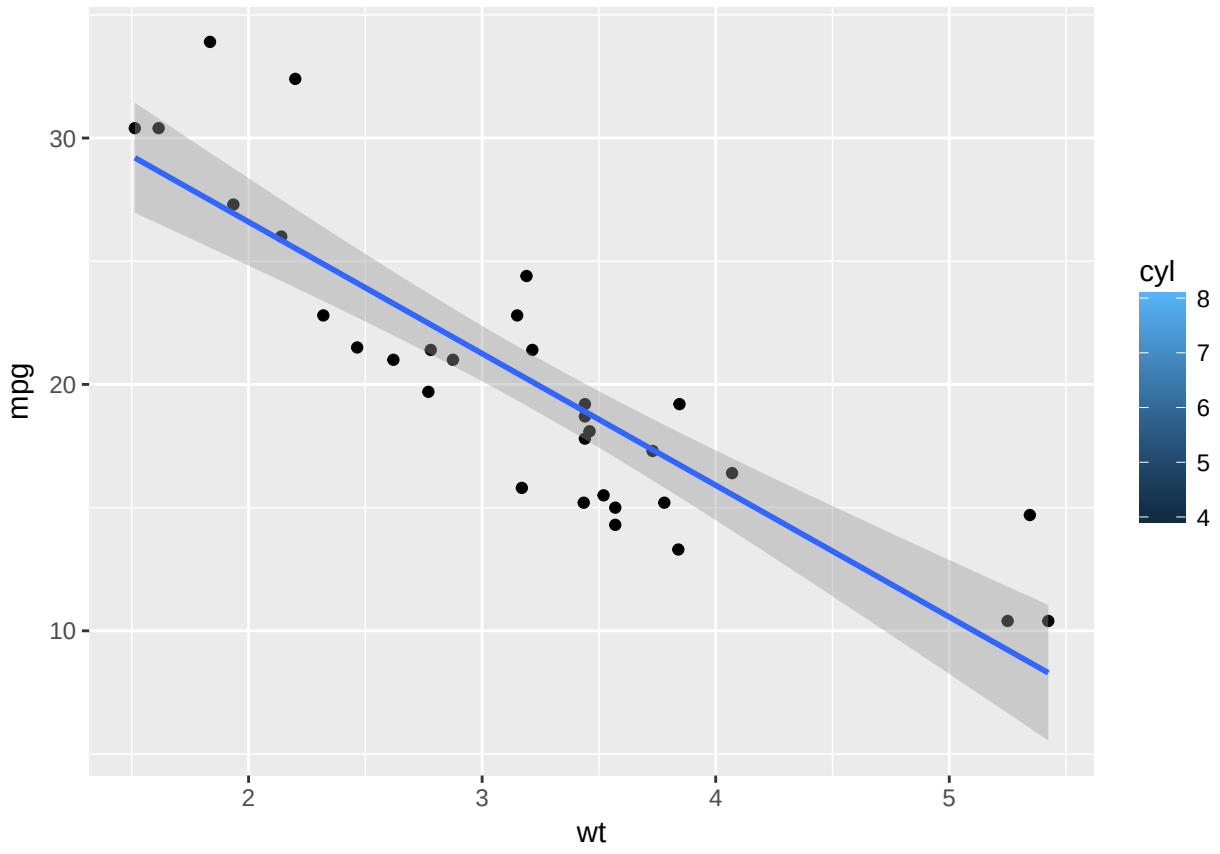
Data

We will all apply our function to the mtcars data set and make a linear model `mpg ~ wt` - but remember the function will be completely general to SLR. Describe the data ?mtcars Describe the nature and type of the variables. Plot the data – be very creative and interpret the plots

```
data(mtcars)
head(mtcars)
```

```
##                   mpg cyl disp  hp drat    wt  qsec vs am gear carb
## Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3    2
## Valiant           18.1   6  225 105 2.76 3.460 20.22  1  0    3    1
```

```
library(ggplot2)
g = ggplot(mtcars, aes(x = wt, y=mpg, fill = cyl)) + geom_point() + geom_smooth(method="lm", formula=y~
g
```



Theory used

Give the mathematical formulae in Latex. Interpret the meaning of the symbols.

Application of SLR to the mtcars data set

Use R to analysze the data `y.lm=lm(y~x,data=mtcars)` Check assumptions `normcheck()` `plot(y.lm, which =1)`

Interpret the summary output. `summary(y.lm)` `ciReg(y.lm)` What are the point and interval estimates? Give full description of validity of model and what can be said from the summary information

Now make your function:

This is where you get to be creative after seeing the sorts of things needed in the example above

Decide on the output you want

Again – be creative and useful.

Plots

1) Plot the data with the fitted line – you can use any package you want – ggplot would work well.
2) The plot can be made to appear when the function is used.
3) The plot should be saved to the working directory as well (automatic).

Files created

You may wish to write summary information to a file using `write.csv` – what sort of information? Perhaps new predictions.

Command line

Create a list of objects you think would be useful – like the beta estimates.

myslr

```
myslr = function(x,y)
{
  y.lm = lm(y~x)

}
```

Now invoke your functiion

```
obj1 = myslr(x=,y=,df=)
obj1
```

Bootstrap

Make a function `myboot` that will create bootstrap estimates from a sample. The parameter estimated will be the population variance σ^2 of mpg for 4 cylinder cars. Though the function will be entirely general.

Make the function

x is a sample vector alpha is the error rate, the `100(1-alpha)%` confidence interval is `quantile(stat, c(alpha/2,1-alpha/2))`

Plots

histogram of the simulated statistic. What statistic will you use to estimate σ^2

Commandline

list of interesting objects like $\hat{\sigma^2}$

File

write a file to the commandline that contains the simulation.

```
myboot = function(x, alpha)
{


}
```

Invoke your function for the mtcars dataset

Must get x by using `subset()` or something else

```
obj = myboot(x=, alpha = 0.05)
obj
```

Make a <5 min recording of both functions running on the data sets with your explanation

You can use quicktime .mov for a mac or use BBFLASH free edition for PC – make as a small file (keep as .fbr)

https://www.flashbackrecorder.com/express/download/