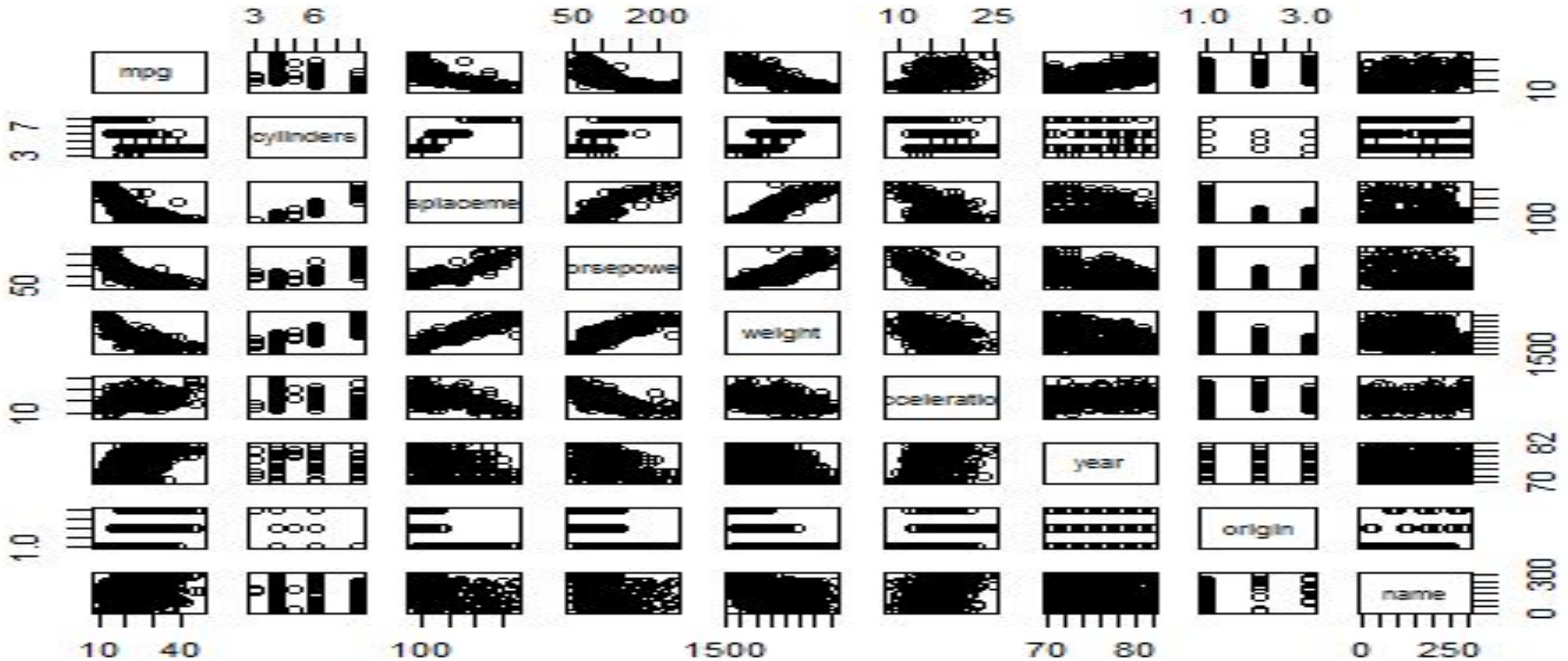
Assignment #2

20161137 복영규

#1


mpg
cylinders
displacement
horsepower
weight
acceleration
year
origin
name

#2

```
> cor(Auto[,names(Auto)!="name"])
                     mpg  cylinders displacement horsepower
mpg           1.0000000 -0.7776175   -0.8051269 -0.7784268
cylinders    -0.7776175  1.0000000    0.9508233  0.8429834
displacement -0.8051269  0.9508233    1.0000000  0.8972570
horsepower   -0.7784268  0.8429834    0.8972570  1.0000000
weight       -0.8322442  0.8975273    0.9329944  0.8645377
acceleration  0.4233285 -0.5046834   -0.5438005 -0.6891955
year          0.5805410 -0.3456474   -0.3698552 -0.4163615
origin        0.5652088 -0.5689316   -0.6145351 -0.4551715
                  weight acceleration       year     origin
mpg          -0.8322442    0.4233285  0.5805410  0.5652088
cylinders     0.8975273   -0.5046834 -0.3456474 -0.5689316
displacement  0.9329944   -0.5438005 -0.3698552 -0.6145351
horsepower    0.8645377   -0.6891955 -0.4163615 -0.4551715
weight        1.0000000   -0.4168392 -0.3091199 -0.5850054
acceleration -0.4168392    1.0000000  0.2903161  0.2127458
year         -0.3091199    0.2903161  1.0000000  0.1815277
origin       -0.5850054    0.2127458  0.1815277  1.0000000
```

#3-1

```
> model = lm(mpg ~ cylinders, data = Auto)
> summary(model)

Call:
lm(formula = mpg ~ cylinders, data = Auto)

Residuals:
     Min       1Q   Median       3Q      Max
-14.2413  -3.1832  -0.6332   2.5491  17.9168

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  42.9155     0.8349   51.40   <2e-16 ***
cylinders    -3.5581     0.1457  -24.43   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.914 on 390 degrees of freedom
Multiple R-squared:  0.6047,     Adjusted R-squared:  0.6037
F-statistic: 596.6 on 1 and 390 DF,  p-value: < 2.2e-16
```

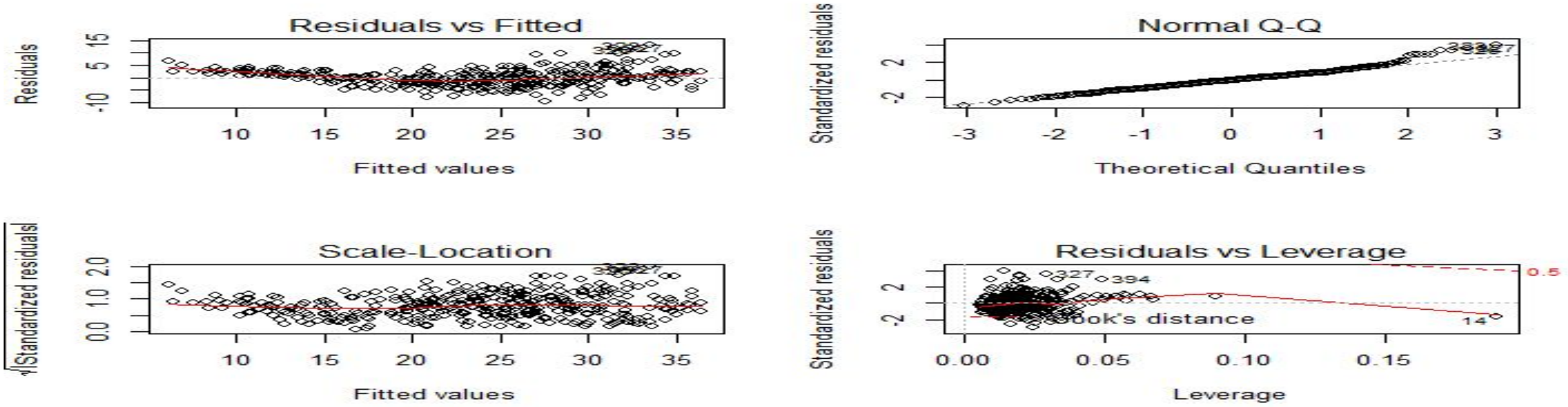
Simple linear regression model (mpg ~ cylinders)
Cylinders have statistically significant relationship to mpg in this model.
mpg = − 3.56 cylinders + 42.92
60.37% of variability of the mpg can be explained by this model.

#3-2

```
> model = lm(mpg ~. -name, data = Auto)
> summary(model)

Call:
lm(formula = mpg ~ . - name, data = Auto)

Residuals:
     Min       1Q   Median       3Q      Max
-9.5903  -2.1565  -0.1169   1.8690  13.0604

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  -17.218435   4.644294  -3.707  0.00024 ***
cylinders     -0.493376   0.323282  -1.526  0.12780
displacement   0.019896   0.007515   2.647  0.00844 **
horsepower    -0.016951   0.013787  -1.230  0.21963
weight        -0.006474   0.000652  -9.929  < 2e-16 ***
acceleration   0.080576   0.098845   0.815  0.41548
year           0.750773   0.050973  14.729  < 2e-16 ***
origin         1.426141   0.278136   5.127 4.67e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.328 on 384 degrees of freedom
Multiple R-squared:  0.8215,    Adjusted R-squared:  0.8182
F-statistic: 252.4 on 7 and 384 DF,  p-value: < 2.2e-16
```

Multiple linear regression model (mpg ~ . – name)
Displacement, weight, year and origin have statistically significant relationship to mpg in this model.
mpg = – 0.49 cylinders + 0.02 displacement – 0.02 horsepower – 0.01 weight + 0.08 acceleration + 0.75 year + 1.43 origin – 17.22
81.82% of variability of the mpg can be explained by this model

#4



Residuals versus Fitted graph seems like U-shaped, that means mpg has non-linear relationship with other variables.
Residuals versus Leverage graph indicates unusually large outliers which standardized residuals value is higher than 2 or lower than -2 and unusually high leverage point which is labeled 14.

#My code

RStudio

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Assignment #2.R*

```
1  #1
2  install.packages("ISLR")
3  library("ISLR")
4  pairs(Auto)
5
6  #2
7  cor(Auto[,names(Auto)!="name"])
8
9  #3
10 model = lm(mpg ~ cylinders, data = Auto)
11 summary(model)
12 model = lm(mpg ~. -name, data = Auto)
13 summary(model)
14
15 #4
16 par(mfrow = c(2,2))
17 plot(model)
18
```

Console C:/Users/YoungKyu/Desktop/경영통계분석/

```
-9.5903 -2.1565 -0.1169  1.8690 13.0604

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  -17.218435   4.644294  -3.707  0.00024 ***
cylinders     -0.493376   0.323282  -1.526  0.12780
displacement   0.019896   0.007515   2.647  0.00844 **
horsepower    -0.016951   0.013787  -1.230  0.21963
weight        -0.006474   0.000652  -9.929  < 2e-16 ***
acceleration   0.080576   0.098845   0.815  0.41548
year           0.750773   0.050973  14.729  < 2e-16 ***
origin         1.426141   0.278136   5.127 4.67e-07 ***
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Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 3.328 on 384 degrees of freedom
Multiple R-squared:  0.8215,    Adjusted R-squared:  0.8182
F-statistic: 252.4 on 7 and 384 DF,  p-value: < 2.2e-16

> par(mfrow = c(2,2))
> plot(model)
>
```

Environment History

Import Dataset | List

Global Environment

Values

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