STAT 652 Assignment 1

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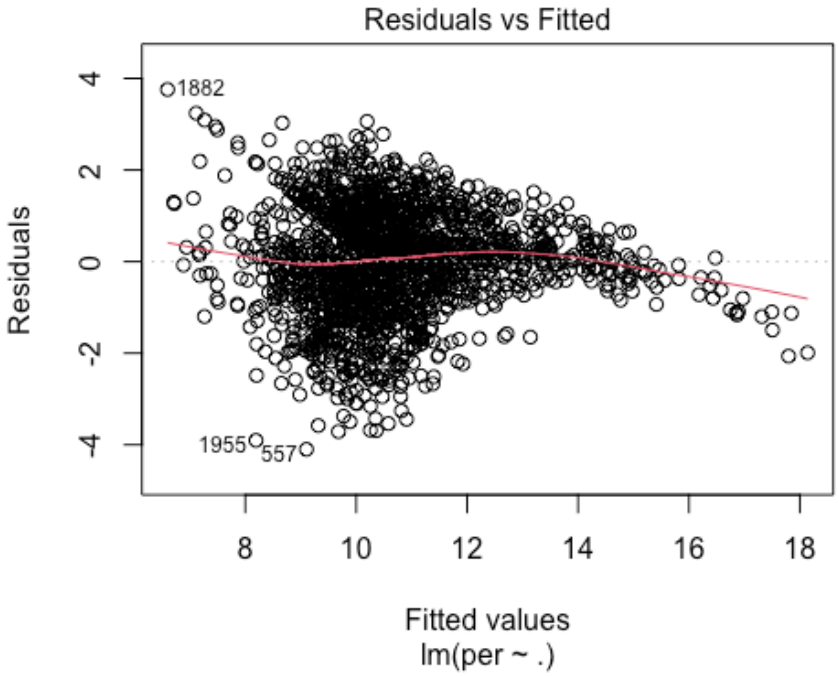
Lecture 4 B

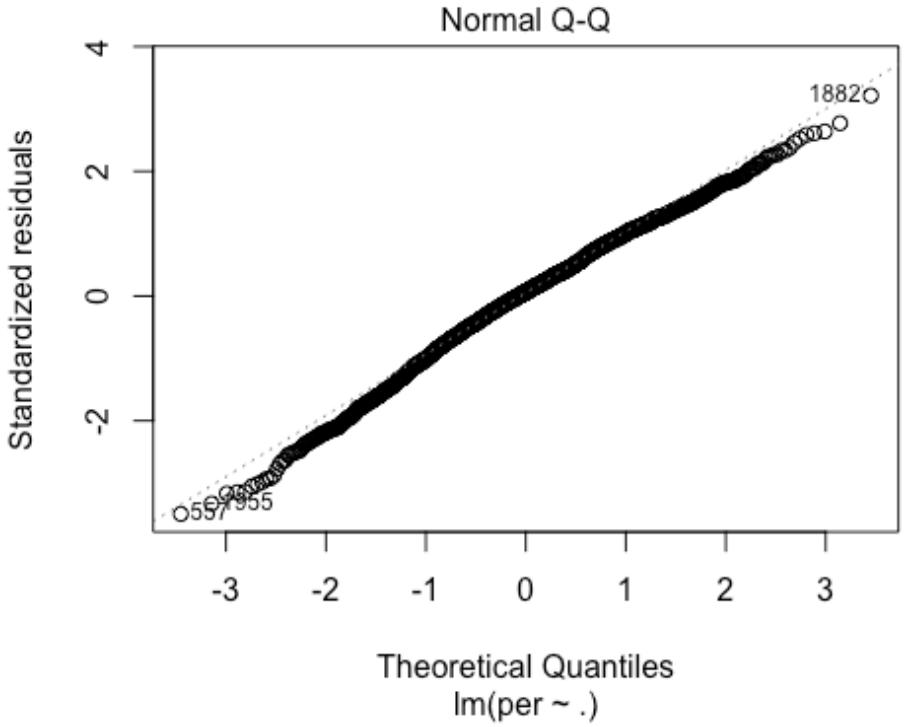
R-code with Answers:

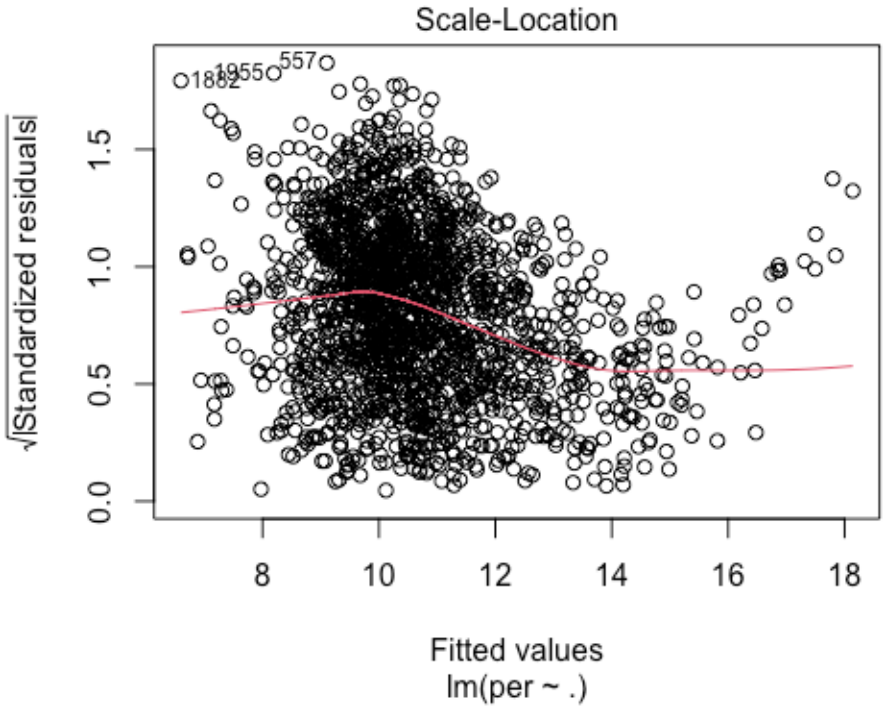
```
# B. Categorical Explanatories
#1
##(a)
ins=read.csv('/Users/dhruv/Downloads/Insurance-1.csv',header=TRUE)
ins$zone = as.factor(ins$zone)
ins$make=as.factor(ins$make)

ins = ins[ins$claims>0,]
dim(ins)
# [1] 1797    7

ins_per_lm = lm(per ~ ., data = ins)
summary(ins_per_lm)

Call:
lm(formula = per ~ ., data = ins)

Residuals:
   Min     1Q  Median     3Q    Max
-4.0994 -0.7170  0.0734  0.8393  3.7574

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.186e+01  1.321e-01  89.770  < 2e-16 ***
km          -3.434e-01  2.064e-02 -16.641  < 2e-16 ***
zone2       -1.376e-01  9.717e-02  -1.416    0.157
zone3       -2.143e-02  9.753e-02  -0.220    0.826
zone4        4.317e-01  9.692e-02   4.454 8.95e-06 ***
zone5       -1.042e+00  1.043e-01  -9.983  < 2e-16 ***
zone6       -4.440e-01  1.009e-01  -4.401 1.14e-05 ***
zone7       -2.862e+00  1.378e-01 -20.767  < 2e-16 ***
```

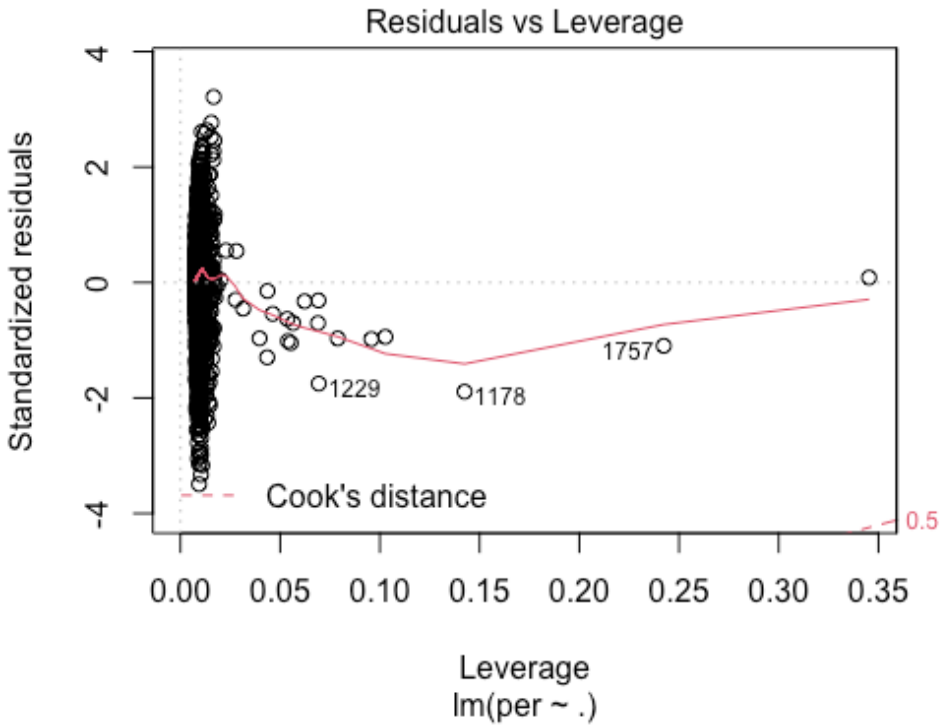
```
bonus       2.301e-01  1.405e-02  16.381  < 2e-16 ***
make2      -1.403e+00  1.140e-01 -12.314  < 2e-16 ***
make3      -1.710e+00  1.189e-01 -14.382  < 2e-16 ***
make4      -1.834e+00  1.240e-01 -14.789  < 2e-16 ***
make5      -1.317e+00  1.138e-01 -11.568  < 2e-16 ***
make6      -8.253e-01  1.129e-01  -7.312 3.95e-13 ***
make7      -1.716e+00  1.153e-01 -14.878  < 2e-16 ***
make8      -2.070e+00  1.199e-01 -17.260  < 2e-16 ***
make9       1.459e+00  1.209e-01  12.071  < 2e-16 ***
insured    -5.724e-05  1.151e-05  -4.975 7.15e-07 ***
claims      3.029e-03  3.519e-04   8.608  < 2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.179 on 1778 degrees of freedom
Multiple R-squared:  0.6477,      Adjusted R-squared:  0.6442
F-statistic: 181.6 on 18 and 1778 DF,  p-value: < 2.2e-16

plot(ins_per_lm)

length(ins_per_lm$coefficients)
# [1] 19

#### (i) 19 parameters are estimated.
#### (ii) Intercept when make1 and zone1 is 1.186e+01.
#### (iii) Intercept at make9 = 1.459e+00 and zone7 = -2.862e+00
```

Summary plots






Scale-Location
√|Standardized residuals|
1882
1955
557
0.0
0.5
1.0
1.5
8
10
12
14
16
18
Fitted values
lm(per ~ .)


Residuals vs Leverage
Standardized residuals
4
2
0
-2
-4
1757
1229
1178
Cook's distance
0.5
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
Leverage
lm(per ~ .)