HW3-code.R

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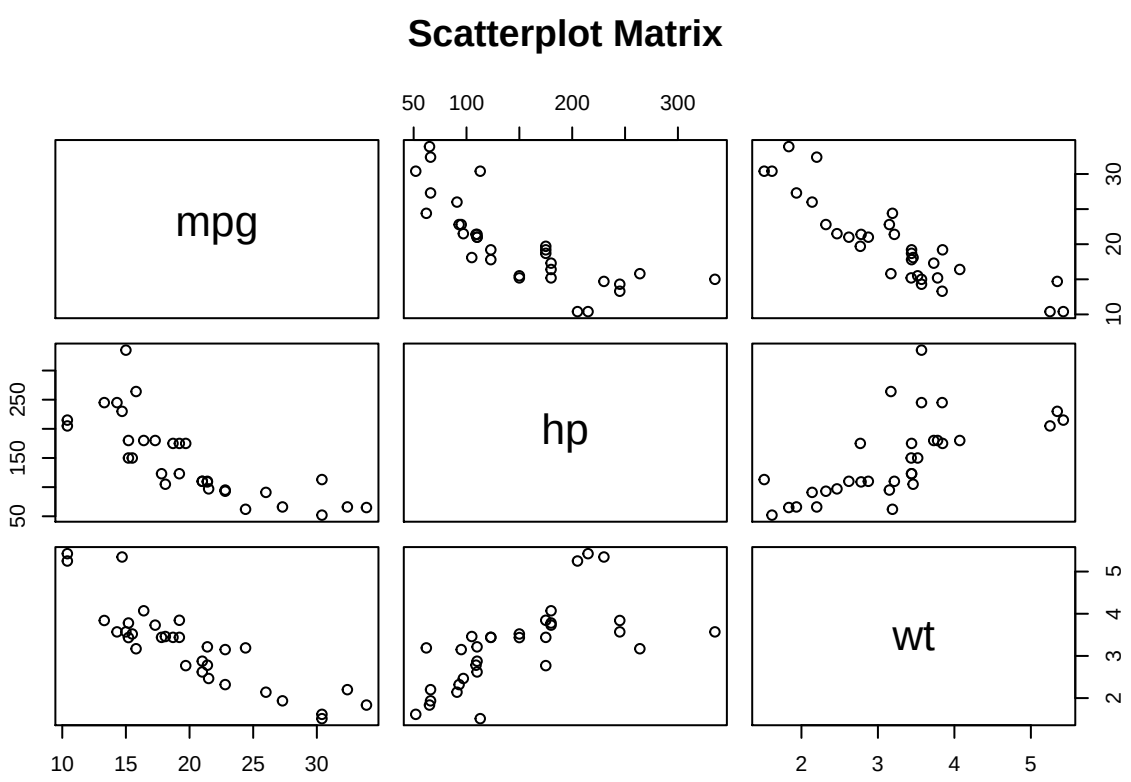
```
attach(mtcars)
######## a ##########
pairs(mpg~hp+wt, main="Scatterplot Matrix")
```




```
# mpg is linearly negatively related to hp and wt.

######## b ##########
fit=lm(mpg~hp+wt)
summary(fit)
```

```
##
## Call:
## lm(formula = mpg ~ hp + wt)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.941 -1.600 -0.182  1.050  5.854
##
## Coefficients:
```

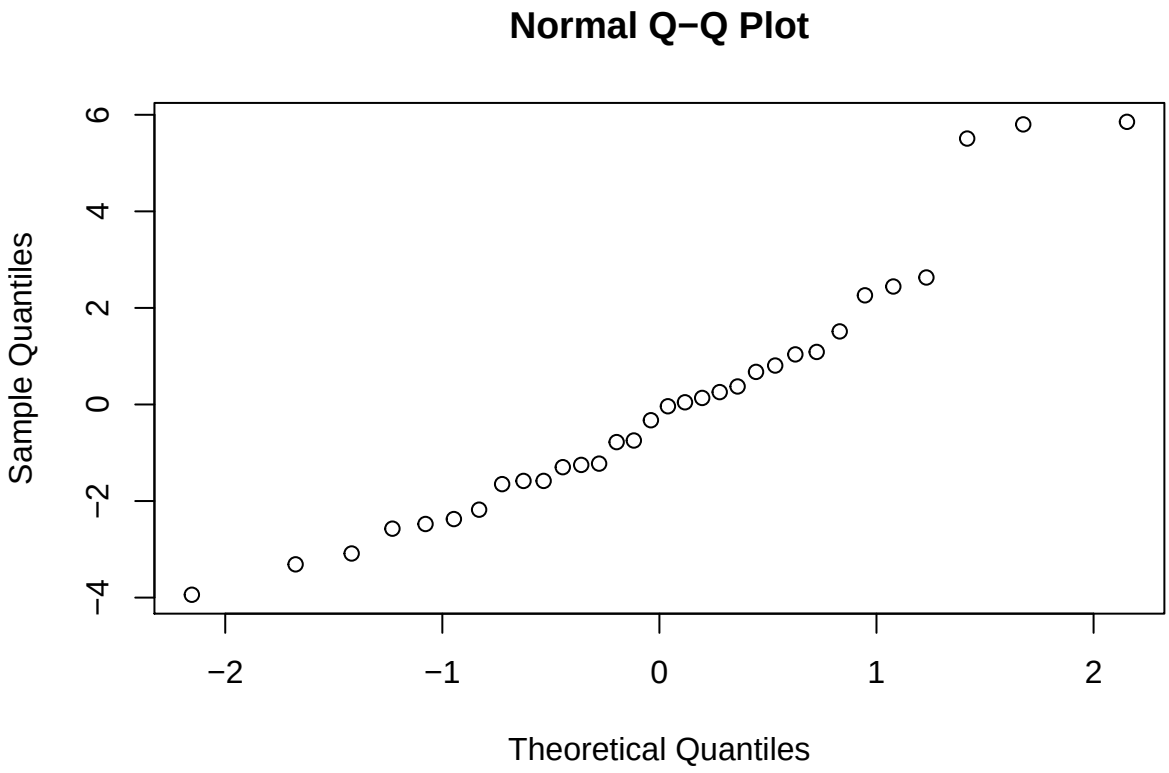
```
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 37.22727    1.59879  23.285  < 2e-16 ***
## hp          -0.03177    0.00903  -3.519  0.00145 **
## wt          -3.87783    0.63273  -6.129 1.12e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.593 on 29 degrees of freedom
## Multiple R-squared:  0.8268, Adjusted R-squared:  0.8148
## F-statistic: 69.21 on 2 and 29 DF,  p-value: 9.109e-12
```

```
anova(fit)
```

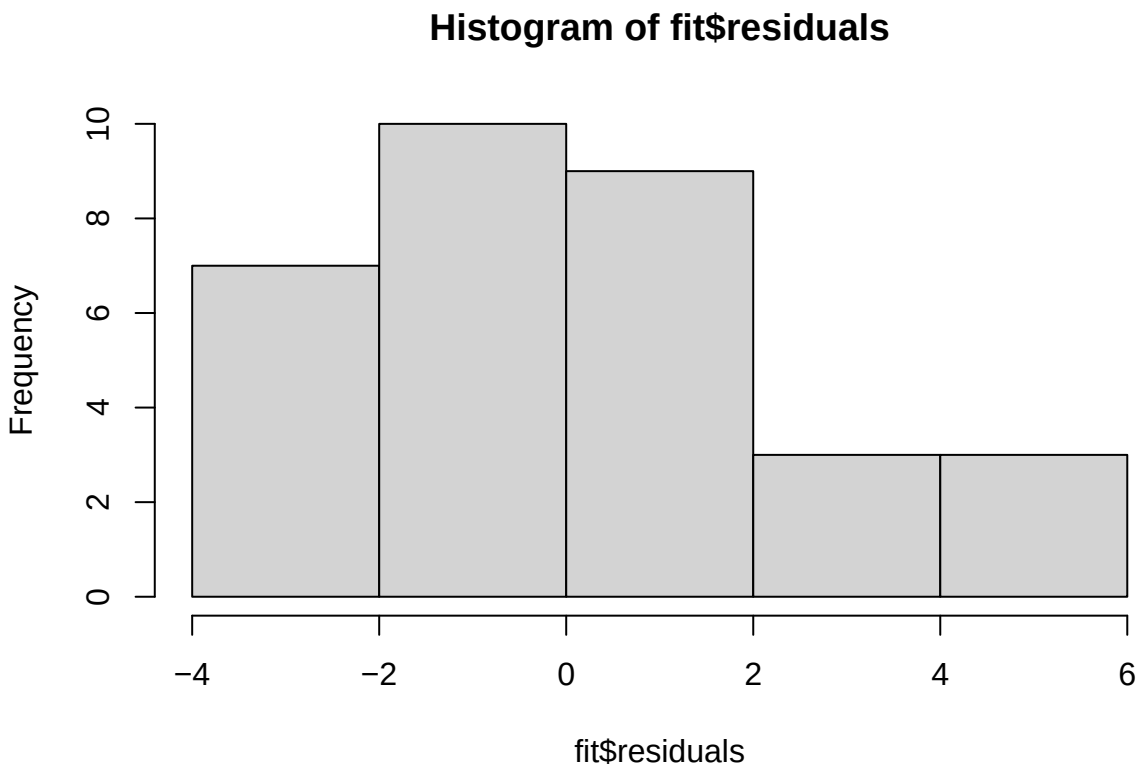
```
## Analysis of Variance Table
##
## Response: mpg
##           Df Sum Sq Mean Sq F value    Pr(>F)
## hp         1 678.37  678.37 100.862 5.987e-11 ***
## wt         1 252.63  252.63  37.561 1.120e-06 ***
## Residuals 29 195.05    6.73
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
######## c ##########
#F test has p-value: 9.109e-12, the overall model is significant
######## d ##########
# t-tests on individual beta both have small p-values. The individual betas are different from 0, and t

######## e ##########
qqnorm(fit$residuals)
```



```
hist(fit$residuals)
```




```
#the residuals have a roughly normal distrubution
######## f ##########
fit.reduced=lm(mpg~hp)
anova(fit.reduced)  #SSR(x1)=678.37
```

```
## Analysis of Variance Table
##
## Response: mpg
##           Df Sum Sq Mean Sq F value    Pr(>F)
## hp         1 678.37  678.37   45.46 1.788e-07 ***
## Residuals 30 447.67   14.92
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#SSR(x2 | x1)= 252.63 from part b
#SSR(x1, x2) = 931
######## g ##########
predict(fit,newdata=data.frame(hp=100,wt=4),se.fit=T,interval = "confidence")
```

```
## $fit
##        fit      lwr      upr
## 1 18.53865 16.58947 20.48784
##
## $se.fit
## [1] 0.9530403
##
## $df
## [1] 29
##
```

```
## $residual.scale
## [1] 2.593412
```

```
# We are 96% confident, the mean mpg for cars with hp 100 and weight 4 tons is between 16.58947 and 20..
```