Ch-03 R Codes

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Textbook: Montgomery, D. C. (2012). *Design and analysis of experiments*, 8th Edition. John Wiley & Sons.
Online handouts: https://github.com/PingYangChen/ANOVA_Course_R_Code

Chapter 3

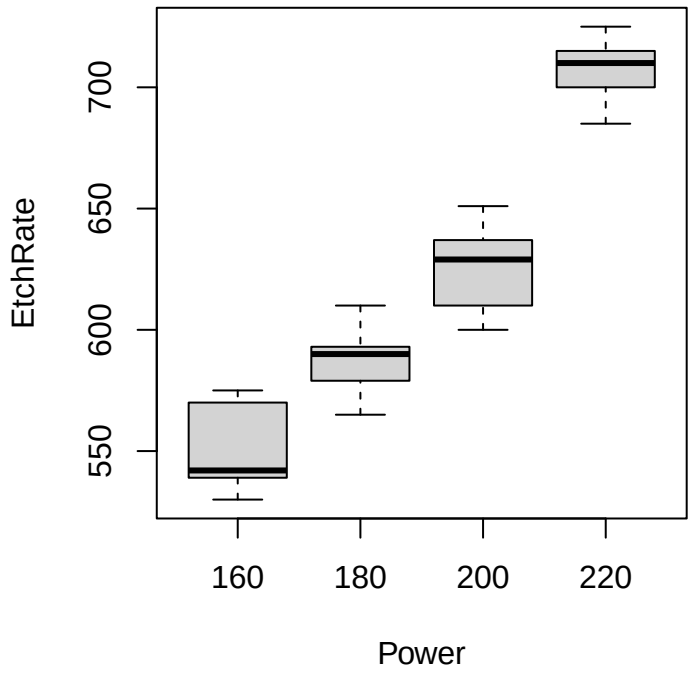
One-way ANOVA

```
df1 <- read.csv(file.path("data", "3_PlasmaEtching.csv"))
```

```
summary(df1)
```

```
##        i             Power        EtchRate
##  Min.   : 1.00   Min.   :160   Min.   :530.0
##  1st Qu.: 5.75   1st Qu.:175   1st Qu.:573.8
##  Median :10.50   Median :190   Median :605.0
##  Mean   :10.50   Mean   :190   Mean   :617.8
##  3rd Qu.:15.25   3rd Qu.:205   3rd Qu.:659.5
##  Max.   :20.00   Max.   :220   Max.   :725.0
```

```
# Draw the grouped boxplot
boxplot(EtchRate ~ Power, data = df1)
```




```r
fit <- aov(EtchRate ~ Power, data = df1)
summary(fit)
```

```
##             Df Sum Sq Mean Sq F value   Pr(>F)
## Power        1  63857   63857   137.6 7.26e-10 ***
## Residuals   18   8352     464
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
mean(df1$EtchRate) # Overall
```

```
## [1] 617.75
```

```r
mean(df1$EtchRate[df1$Power == 160]) - mean(df1$EtchRate) # tau_1
```

```
## [1] -66.55
```

```r
mean(df1$EtchRate[df1$Power == 180]) - mean(df1$EtchRate) # tau_2
```

```
## [1] -30.35
```

```r
mean(df1$EtchRate[df1$Power == 200]) - mean(df1$EtchRate) # tau_3
```

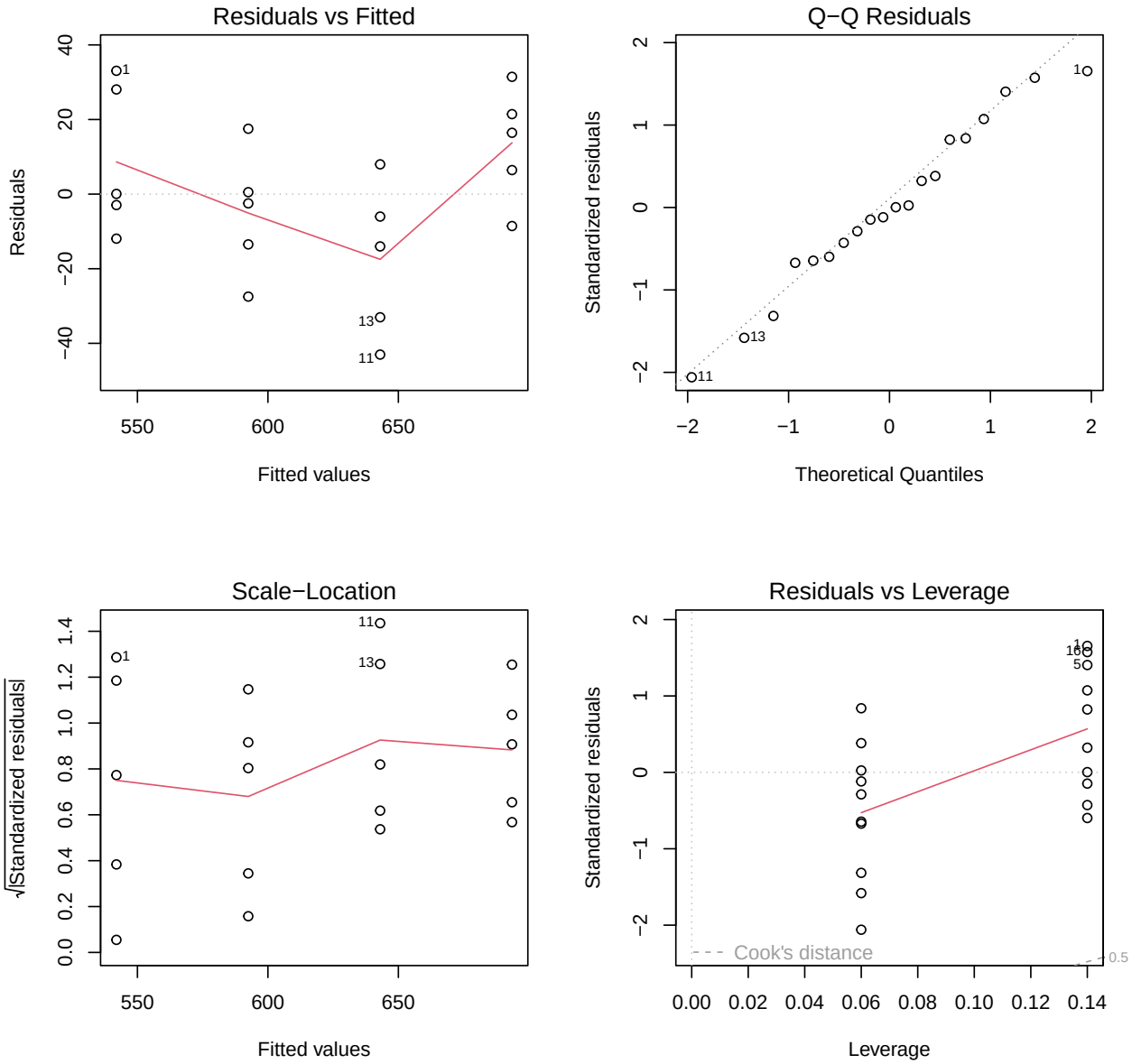
```
## [1] 7.65
```

```r
mean(df1$EtchRate[df1$Power == 220]) - mean(df1$EtchRate) # tau_4
```

```
## [1] 89.25
```

```r
if (!("agricolae" %in% rownames(installed.packages()))) {
  install.packages("agricolae")
}
library(agricolae)
out <- LSD.test(fit, "Power")
```

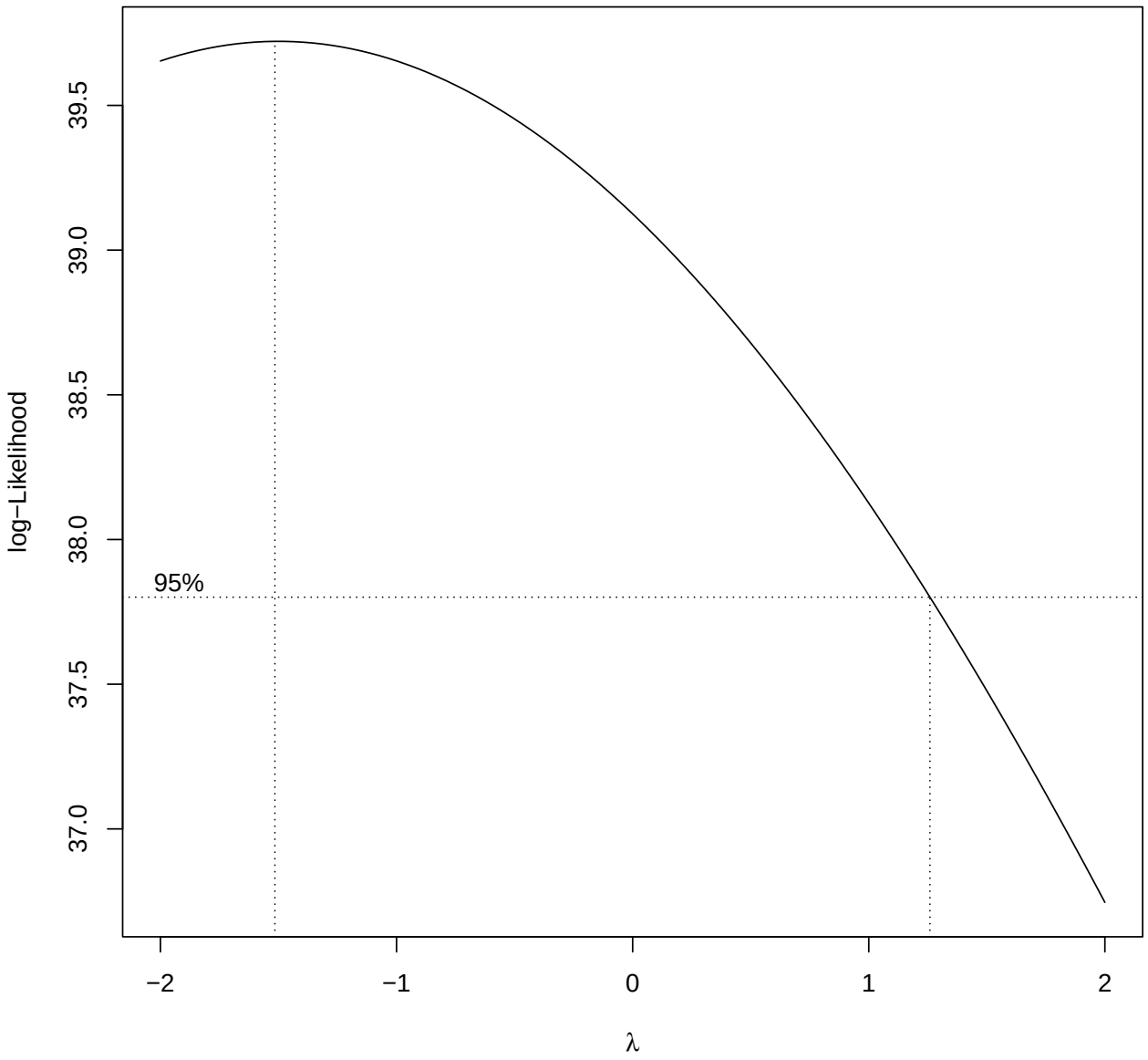
```r
par(mfrow = c(2, 2))
plot(fit)
```



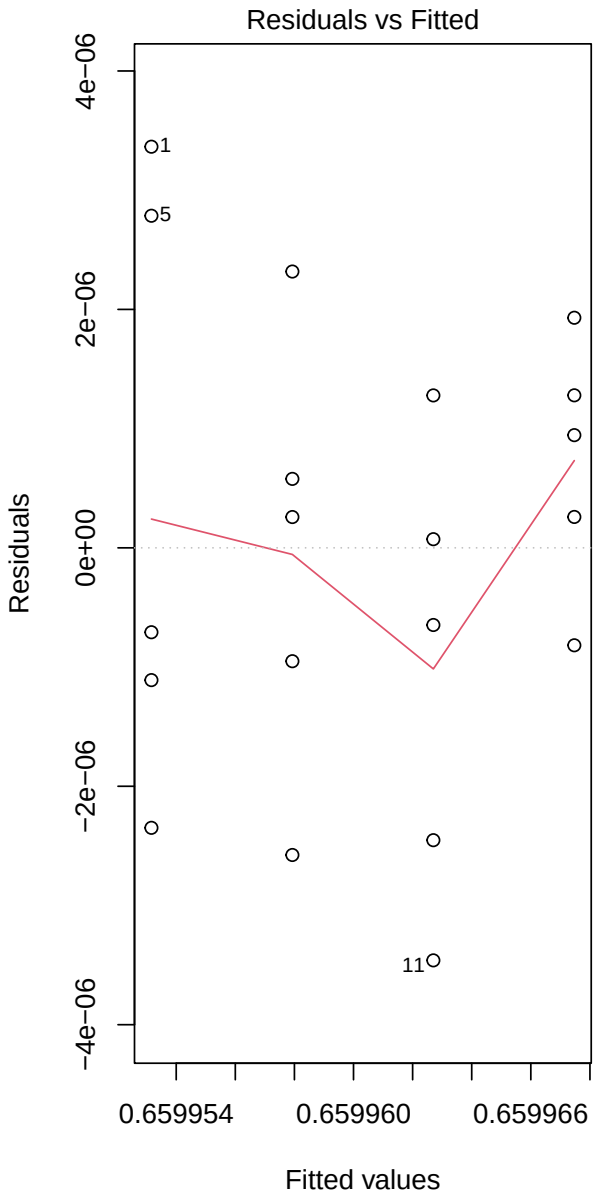

```r
par(mfrow = c(1, 1))
```

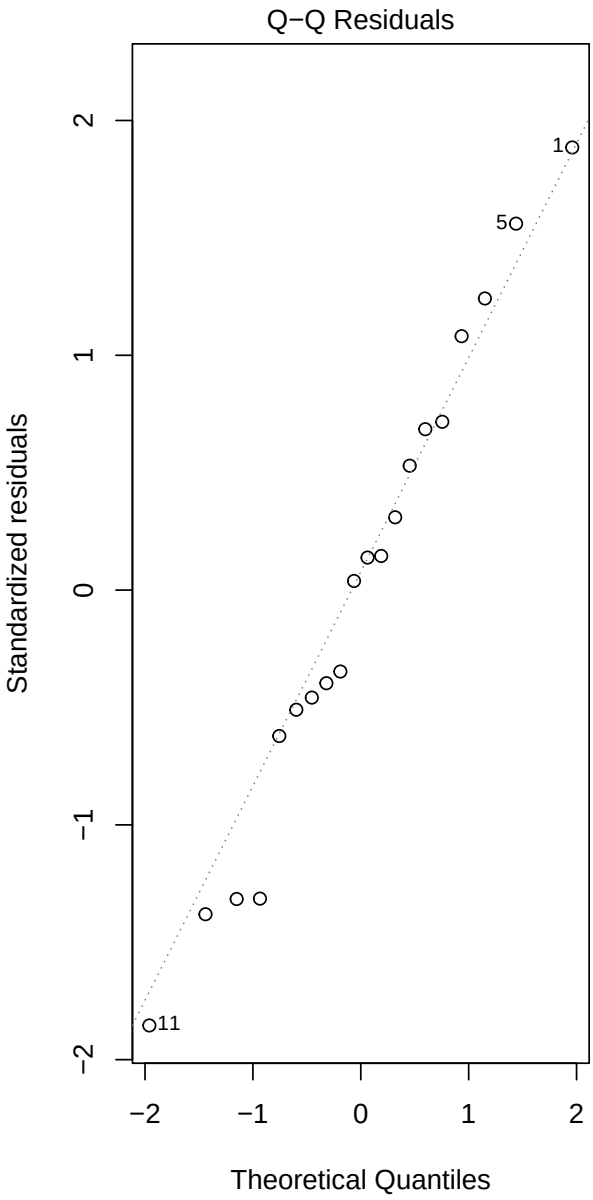
Box-Cox Transformation

```
library(MASS)
bc_tune <- boxcox(EtchRate ~ Power, data = df1, plotit = TRUE)
```




```
# Obtain the best lambda value
lambda <- bc_tune$x[which.max(bc_tune$y)]
# Construct the regression model with Box-Cox transformation
bc_mdl <- aov( I((EtchRate^lambda - 1)/lambda) ~ Power, data = df1)
#summary(bc_demo_mdl)
#anova(bc_demo_mdl)
par(mfrow = c(1, 2))
plot(bc_mdl, which = 1)
plot(bc_mdl, which = 2)
```






```
par(mfrow = c(1, 1))
```