

marks_proj_work

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Exploratory Analysis

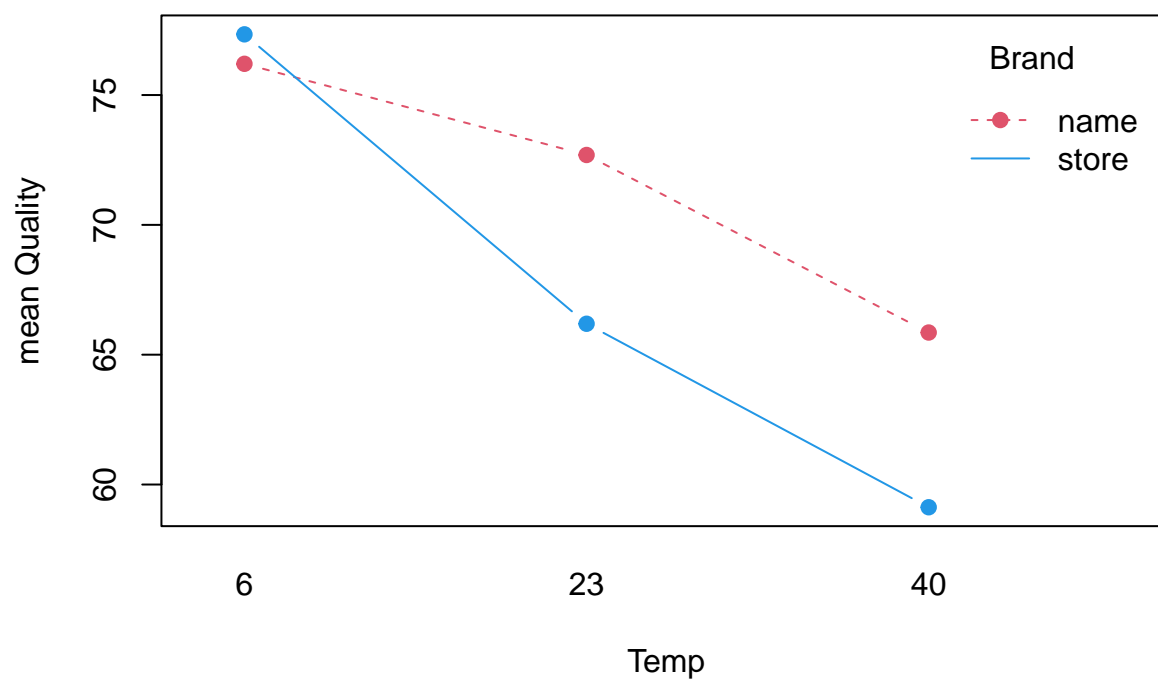
```
#using Halid's code to keep data frame consistent
library(tidyverse)
df_eff <- read_csv('effervescence.csv', col_types = 'ffnmm')
df_eff %>% head()
```

```
## # A tibble: 6 x 6
##   Brand Temp  Stirred Order  Time OrgTime
##   <fct> <fct> <fct>   <dbl> <dbl>   <dbl>
## 1 name   6     yes       8  77.2    75.5
## 2 name  23     yes       3  75.4    68.1
## 3 name  40     yes       7  68.1    44.8
## 4 store 6     yes       1  77.9    78.4
## 5 store 23     yes       2  66.4    40.6
## 6 store 40     yes      18  59.8    27.4
```

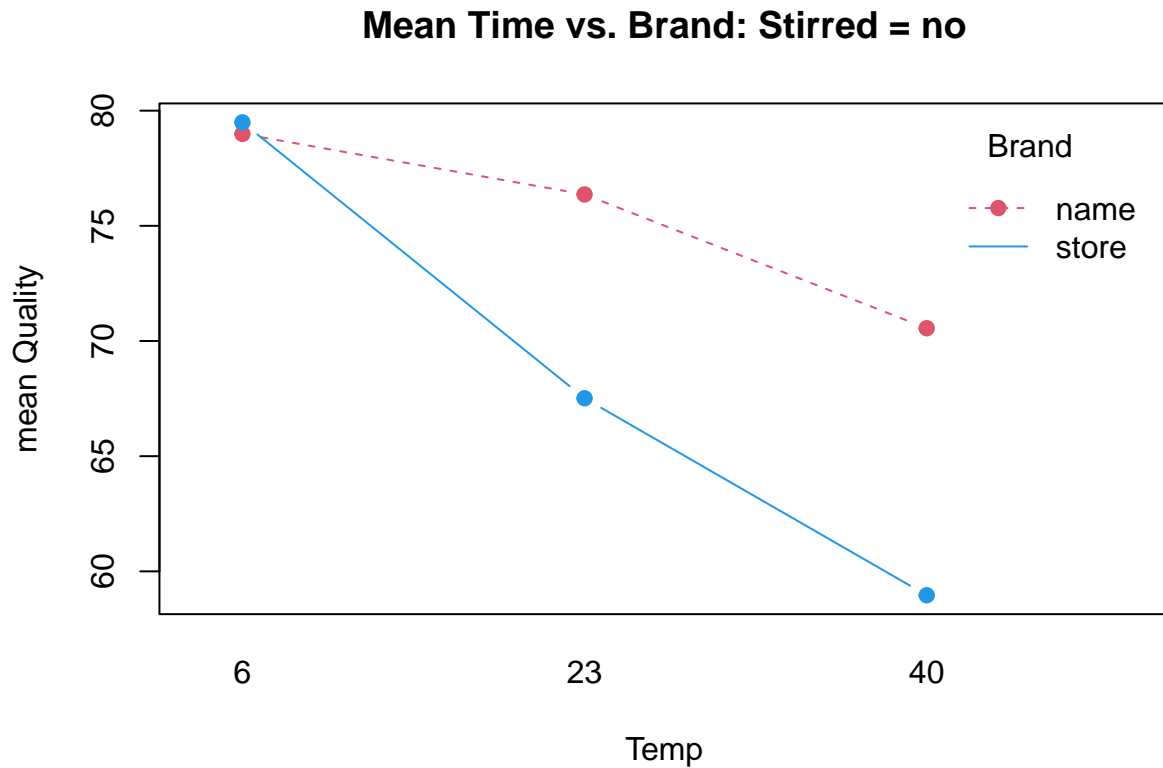
```
##3 factor interaction plot based on HW7 code
```

```
with(df_eff%>%filter(Stirred=="yes"),interaction.plot(Temp,Brand,Time,
  type="b", pch=19, col=c(2,4), ylab="mean Quality",
  main="Mean Time vs. Brand: Stirred = yes"))
```

Mean Time vs. Brand: Stirred = yes



```
with(df_eff%>%filter(Stirred=="no"),interaction.plot(Temp,Brand,Time,  
  type="b", pch=19, col=c(2,4), ylab="mean Quality",  
  main="Mean Time vs. Brand: Stirred = no"))
```



From the three factor interaction plots, we can

Analysis and Results

```
#model with stirred as block effect without interaction
aov_block_eff <- aov(lm_block_eff <- lm(Time ~ Brand * Temp + Stirred, data = df_eff))
summary(lm_block_eff)
```

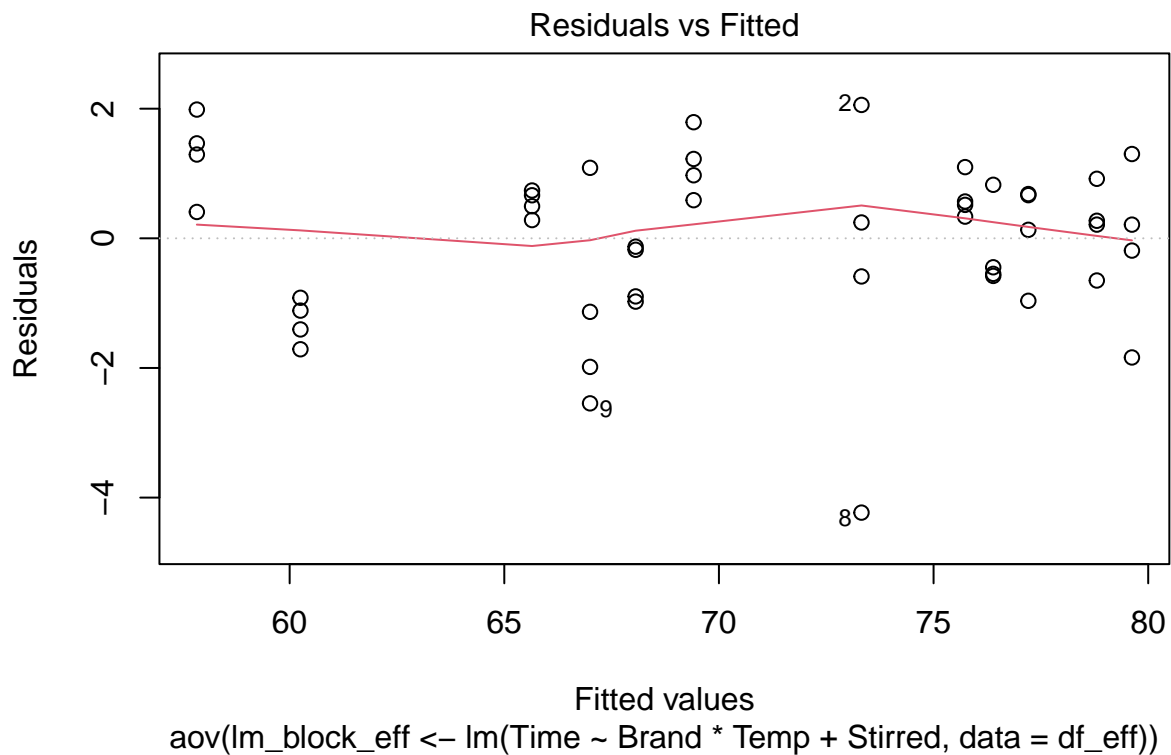
```
##
## Call:
## lm(formula = Time ~ Brand * Temp + Stirred, data = df_eff)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.2315 -0.7120  0.2577  0.7596  2.0577
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    76.3899     0.5035  151.710 < 2e-16 ***
## Brandstore       0.8182     0.6593   1.241   0.222
## Temp23          -3.0690     0.6593  -4.655 3.38e-05 ***
## Temp40          -9.3922     0.6593 -14.246 < 2e-16 ***
## Stirredno       2.4133     0.3806   6.340 1.42e-07 ***
## Brandstore:Temp23 -8.4923     0.9323  -9.108 2.11e-11 ***
## Brandstore:Temp40 -9.9781     0.9323 -10.702 1.93e-13 ***
```

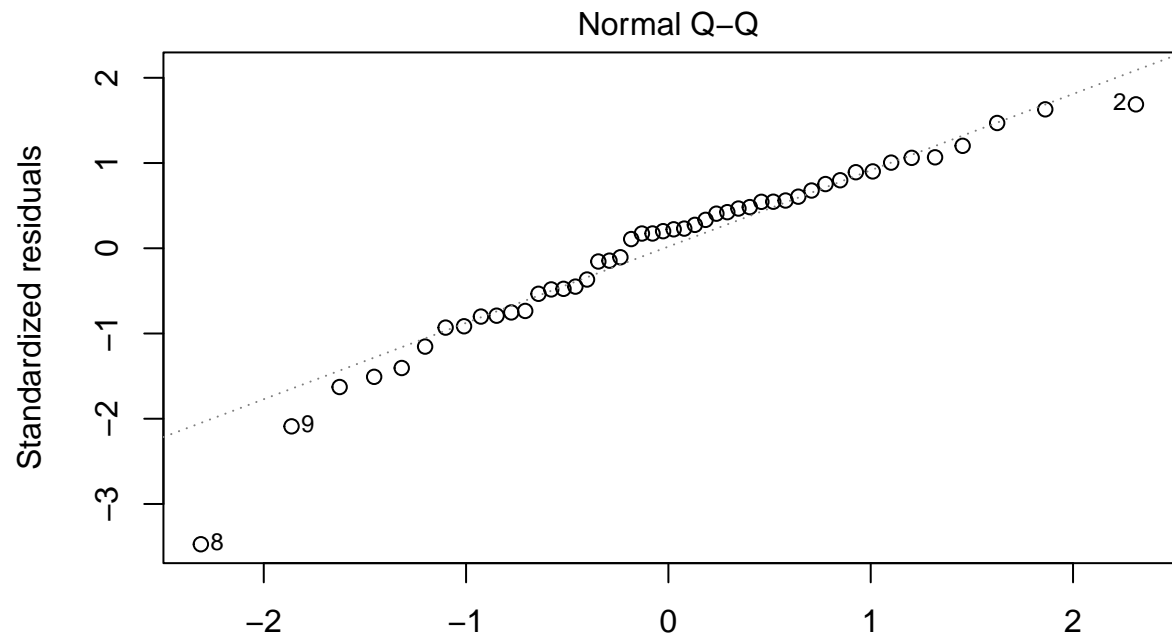
```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.319 on 41 degrees of freedom
## Multiple R-squared:  0.9699, Adjusted R-squared:  0.9655
## F-statistic: 220.3 on 6 and 41 DF,  p-value: < 2.2e-16
```

```
summary(aov_block_eff)
```

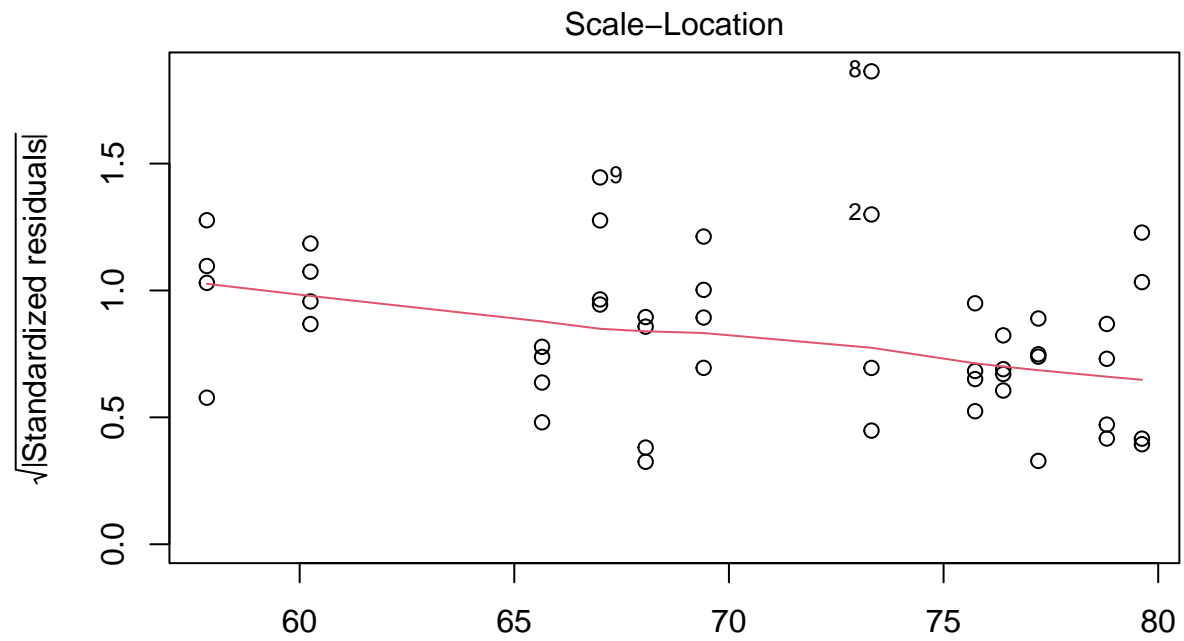
```
##           Df Sum Sq Mean Sq F value    Pr(>F)
## Brand       1  342.0   342.0   196.72 < 2e-16 ***
## Temp        2 1654.7   827.4   475.89 < 2e-16 ***
## Stirred     1   69.9    69.9    40.20 1.42e-07 ***
## Brand:Temp   2  231.9   115.9    66.68 1.30e-13 ***
## Residuals   41   71.3     1.7
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
plot(aov_block_eff)
```

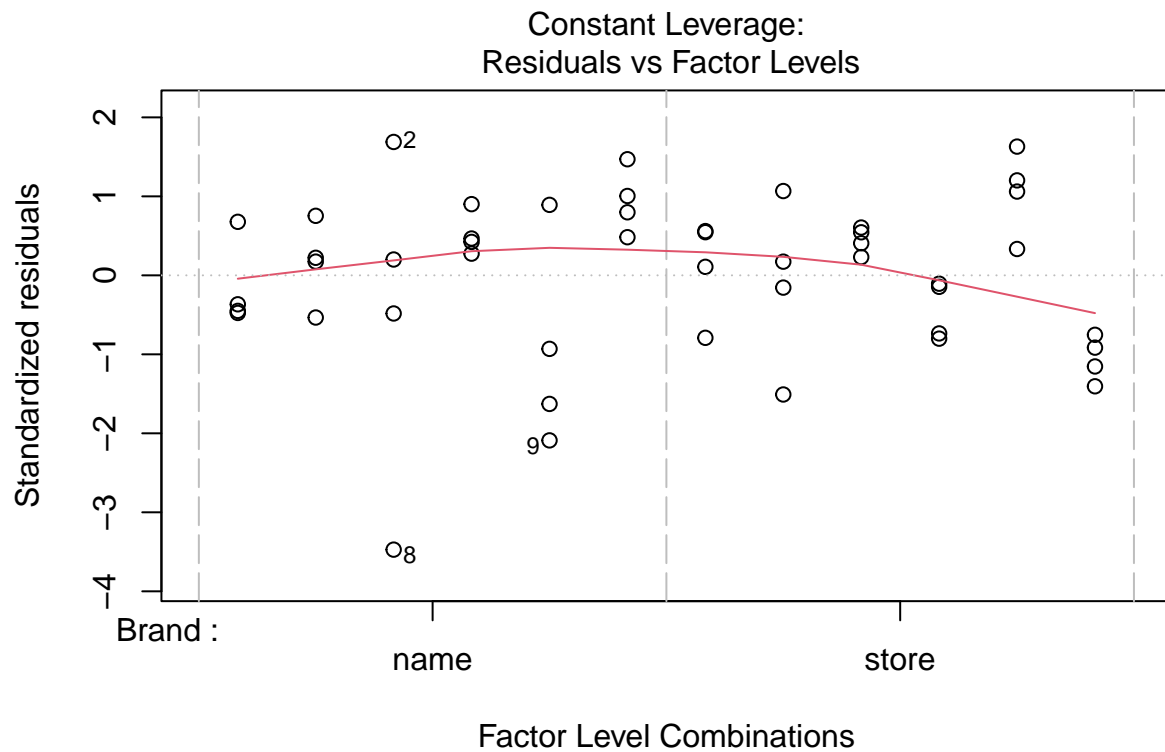




aov(lm_block_eff <- lm(Time ~ Brand * Temp + Stirred, data = df_eff))



Fitted values
`aov(lm_block_eff <- lm(Time ~ Brand * Temp + Stirred, data = df_eff))`



```
library(olsrr)
```

```
## Warning: package 'olsrr' was built under R version 4.1.3
```

```
##
```

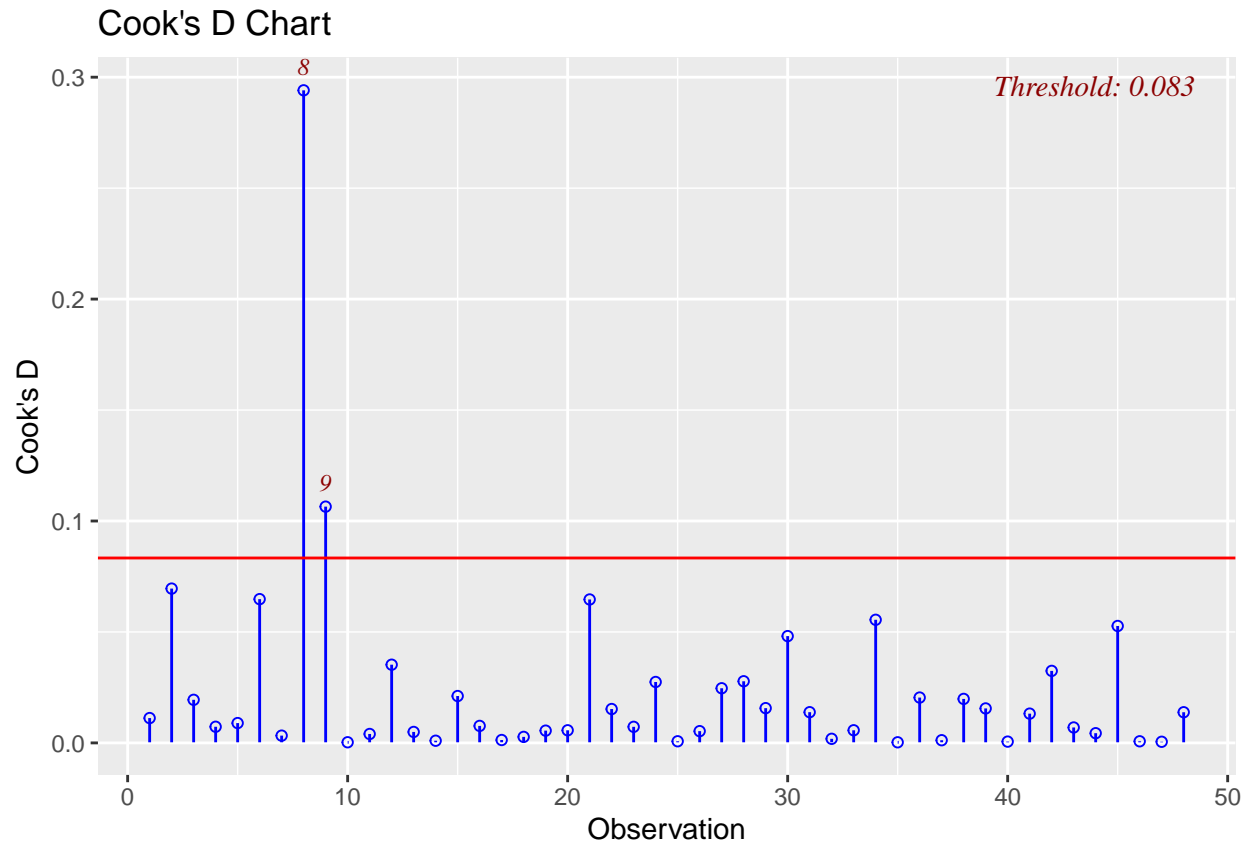
```
## Attaching package: 'olsrr'
```

```
## The following object is masked from 'package:datasets':
```

```
##
```

```
## rivers
```

```
ols_plot_cooksd_chart(lm_block_eff)
```



```
#adding Halid's code to see how full 3 factor interaction compares
aov_eff <- aov(lm_eff <- lm(Time ~ Brand * Temp * Stirred, data = df_eff))
summary(lm_eff)
```

```
##
## Call:
## lm(formula = Time ~ Brand * Temp * Stirred, data = df_eff)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3.6021 -0.3538  0.0077  0.3816  2.6871
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      76.2024    0.5374 141.794 < 2e-16 ***
## Brandstore         1.1346    0.7600   1.493 0.144185
## Temp23            -3.5110    0.7600  -4.620 4.78e-05 ***
## Temp40           -10.3490    0.7600 -13.617 9.05e-16 ***
## Stirredno          2.7882    0.7600   3.669 0.000783 ***
## Brandstore:Temp23  -7.6348    1.0748  -7.103 2.40e-08 ***
## Brandstore:Temp40  -7.8628    1.0748  -7.315 1.27e-08 ***
## Brandstore:Stirredno -0.6328    1.0748  -0.589 0.559694
## Temp23:Stirredno    0.8839    1.0748   0.822 0.416308
## Temp40:Stirredno    1.9135    1.0748   1.780 0.083476 .
## Brandstore:Temp23:Stirredno -1.7150    1.5200  -1.128 0.266685
```

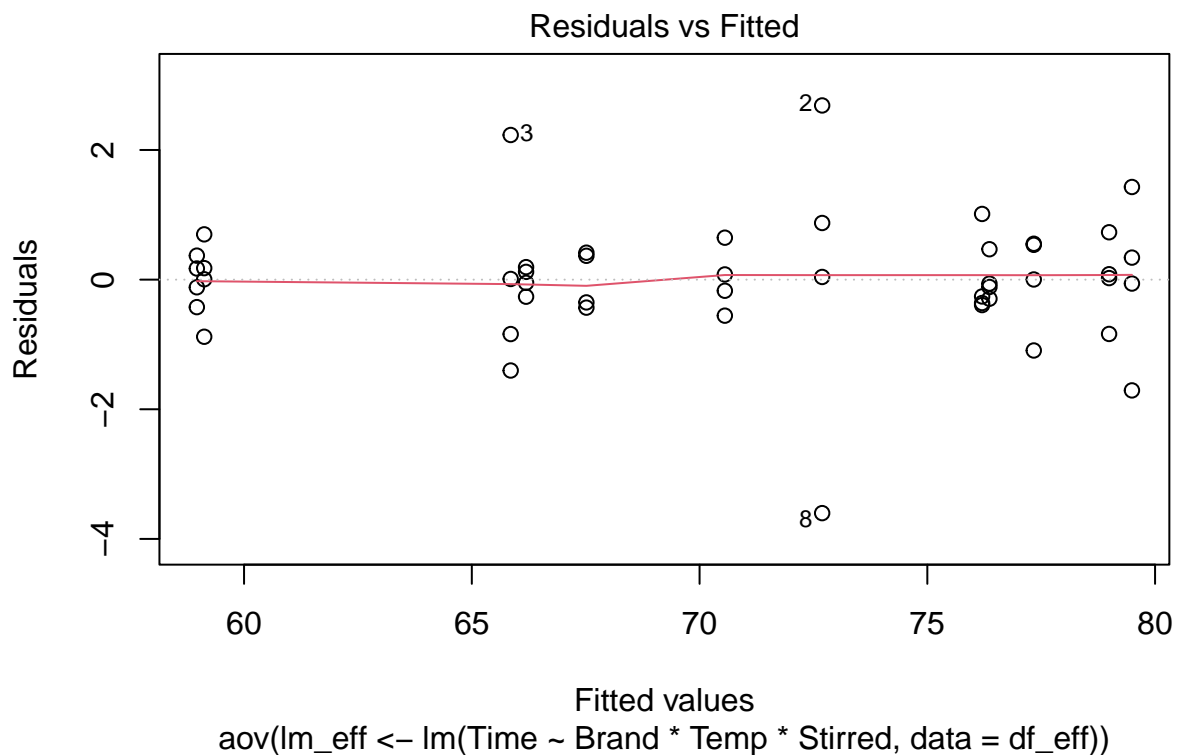


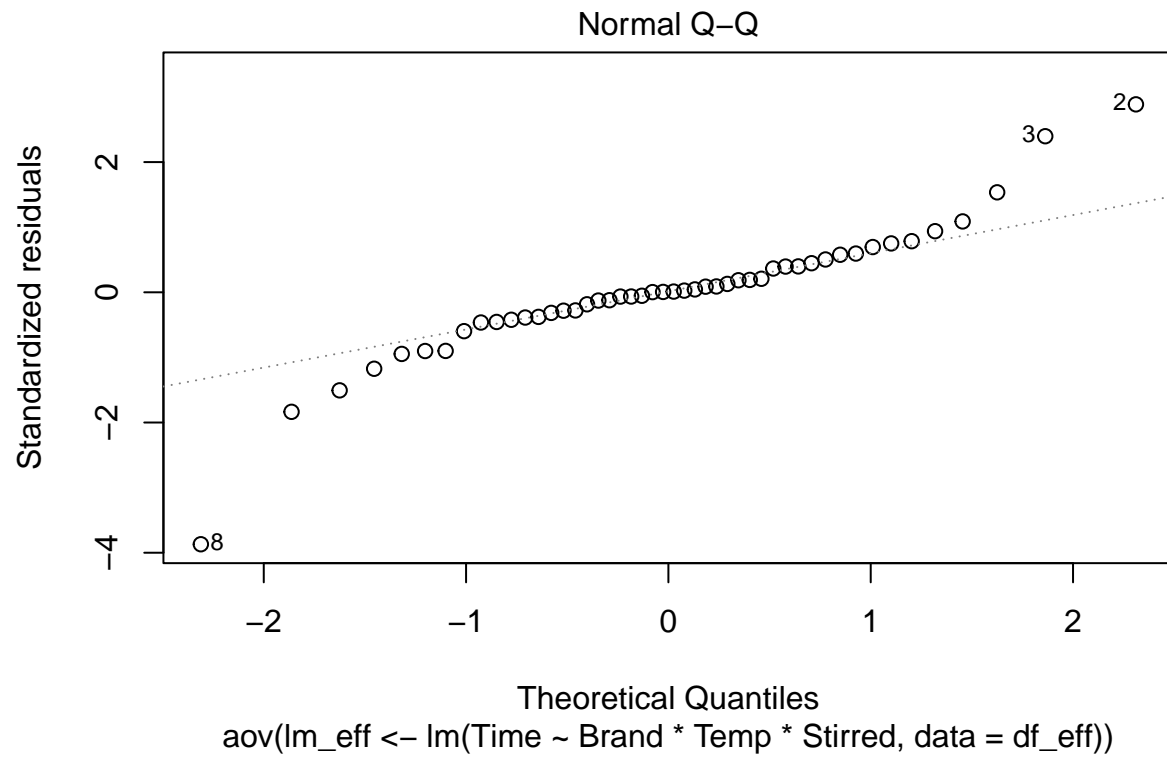
```
## Brandstore:Temp40:Stirredno -4.2307      1.5200 -2.783 0.008519 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.075 on 36 degrees of freedom
## Multiple R-squared:  0.9824, Adjusted R-squared:  0.9771
## F-statistic: 183.2 on 11 and 36 DF,  p-value: < 2.2e-16
```

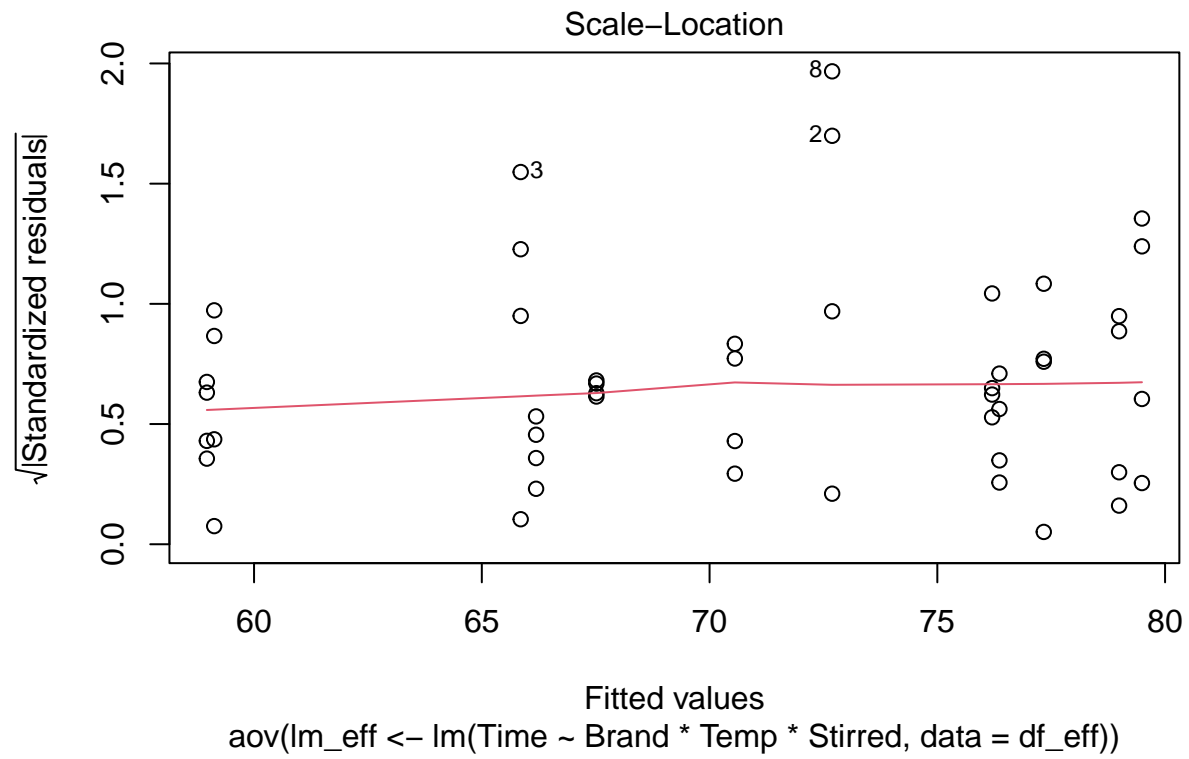
```
summary(aov_eff)
```

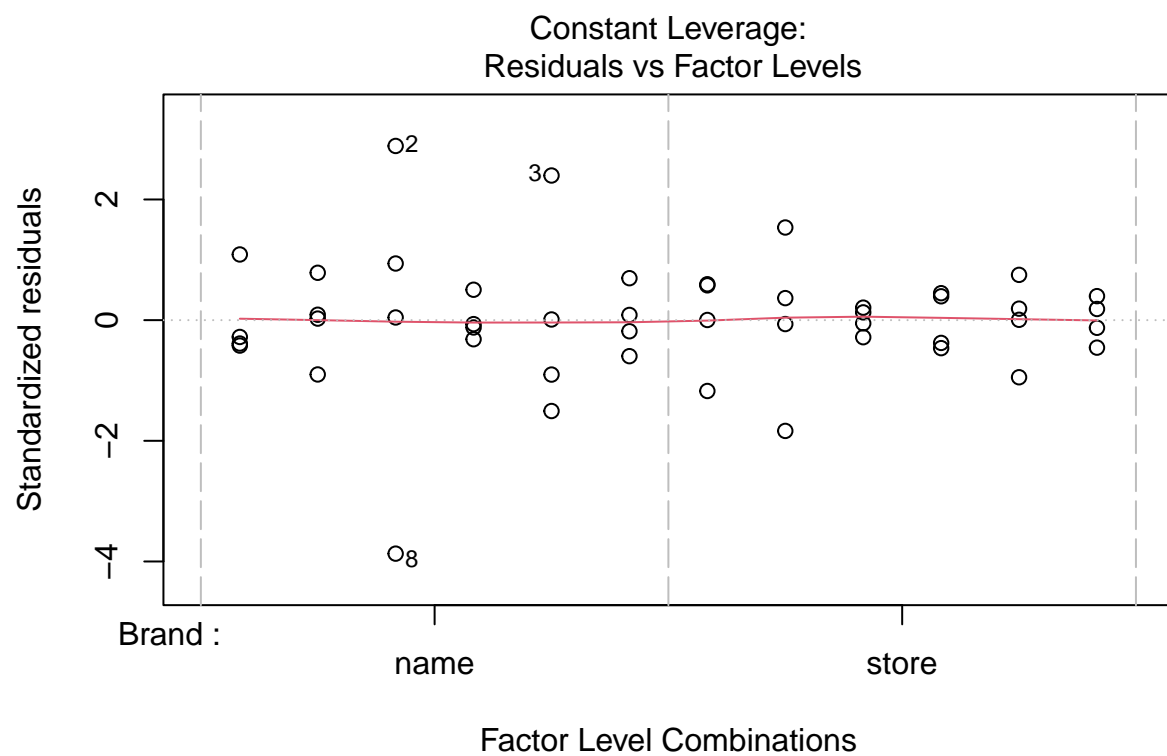
```
##
##              Df Sum Sq Mean Sq F value    Pr(>F)
## Brand          1  342.0   342.0 296.041 < 2e-16 ***
## Temp           2 1654.7   827.4 716.169 < 2e-16 ***
## Stirred        1   69.9    69.9  60.495 3.22e-09 ***
## Brand:Temp      2  231.9   115.9 100.345 1.90e-15 ***
## Brand:Stirred   1   20.5    20.5  17.753 0.000161 ***
## Temp:Stirred    2    0.1     0.1   0.054 0.947535
## Brand:Temp:Stirred 2    9.1     4.5   3.919 0.028838 *
## Residuals      36   41.6     1.2
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
plot(aov_eff)
```









```
#adding Cook's D here  
ols_plot_cooksd_chart(lm_eff)
```

