HS 16

vi indlæser data

```
pillbug <- read_table2("../pillbug.txt")
```

```
## Parsed with column specification:
## cols(
##   time = col_double(),
##   group = col_character()
## )
```

1

Eksperimentet lægger op til en etsidet variansanalyse, da vi kun undersøger en faktor, nemlig tid. De enkelte X'ier (bækebiderne) er uafhængige, og normalfordelte.

```
A <- model.matrix(~ pillbug$group -1)
A
```

```
##    pillbug$groupControl pillbug$groupLight pillbug$groupMoisture
## 1                     0                  1                     0
## 2                     0                  1                     0
## 3                     0                  1                     0
## 4                     0                  1                     0
## 5                     0                  1                     0
## 6                     0                  1                     0
## 7                     0                  1                     0
## 8                     0                  1                     0
## 9                     0                  1                     0
## 10                    0                  1                     0
## 11                    0                  1                     0
## 12                    0                  1                     0
## 13                    0                  1                     0
## 14                    0                  1                     0
## 15                    0                  1                     0
## 16                    0                  1                     0
## 17                    0                  1                     0
## 18                    0                  1                     0
## 19                    0                  1                     0
## 20                    0                  1                     0
## 21                    0                  0                     1
## 22                    0                  0                     1
## 23                    0                  0                     1
## 24                    0                  0                     1
## 25                    0                  0                     1
```

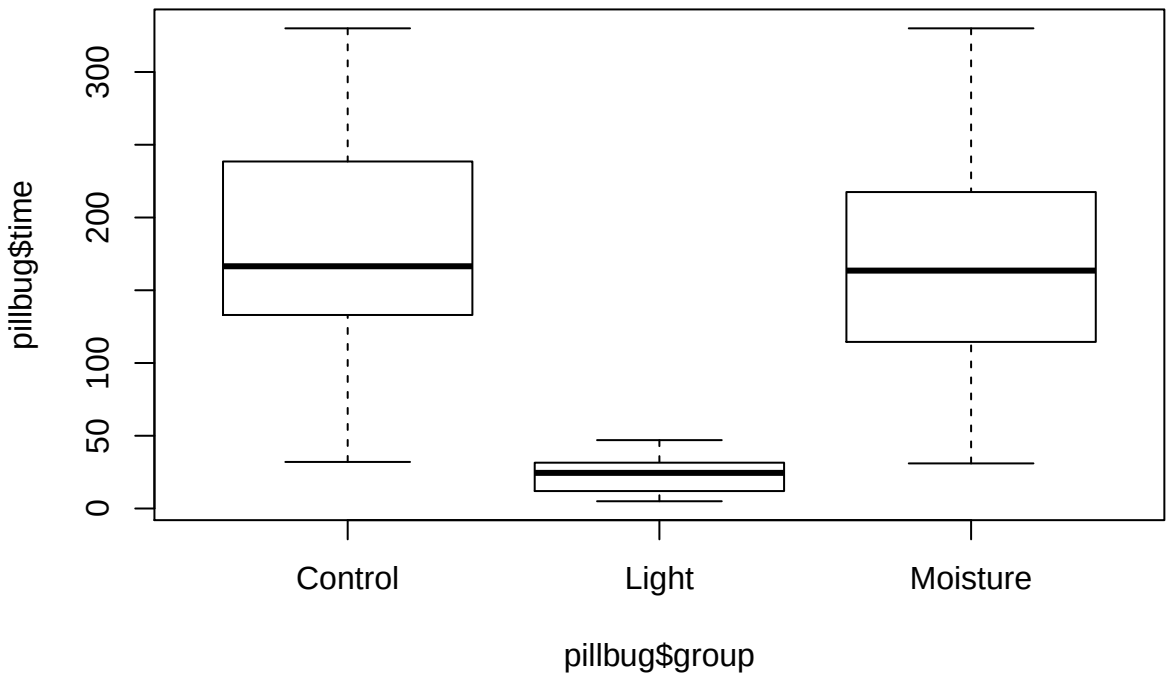
```
## 26                  0                  0                  1
## 27                  0                  0                  1
## 28                  0                  0                  1
## 29                  0                  0                  1
## 30                  0                  0                  1
## 31                  0                  0                  1
## 32                  0                  0                  1
## 33                  0                  0                  1
## 34                  0                  0                  1
## 35                  0                  0                  1
## 36                  0                  0                  1
## 37                  0                  0                  1
## 38                  0                  0                  1
## 39                  0                  0                  1
## 40                  0                  0                  1
## 41                  1                  0                  0
## 42                  1                  0                  0
## 43                  1                  0                  0
## 44                  1                  0                  0
## 45                  1                  0                  0
## 46                  1                  0                  0
## 47                  1                  0                  0
## 48                  1                  0                  0
## 49                  1                  0                  0
## 50                  1                  0                  0
## 51                  1                  0                  0
## 52                  1                  0                  0
## 53                  1                  0                  0
## 54                  1                  0                  0
## 55                  1                  0                  0
## 56                  1                  0                  0
## 57                  1                  0                  0
## 58                  1                  0                  0
## 59                  1                  0                  0
## 60                  1                  0                  0
## attr(,"assign")
## [1] 1 1 1
## attr(,"contrasts")
## attr(,"contrasts")$`pillbug$group`
## [1] "contr.treatment"
```

```
?model.matrix #finde ud af hvilke paramtre der skal indgår i kommandoen
```

```
## starting httpd help server ... done
```

2

```
boxplot(pillbug$time ~ pillbug$group)
```

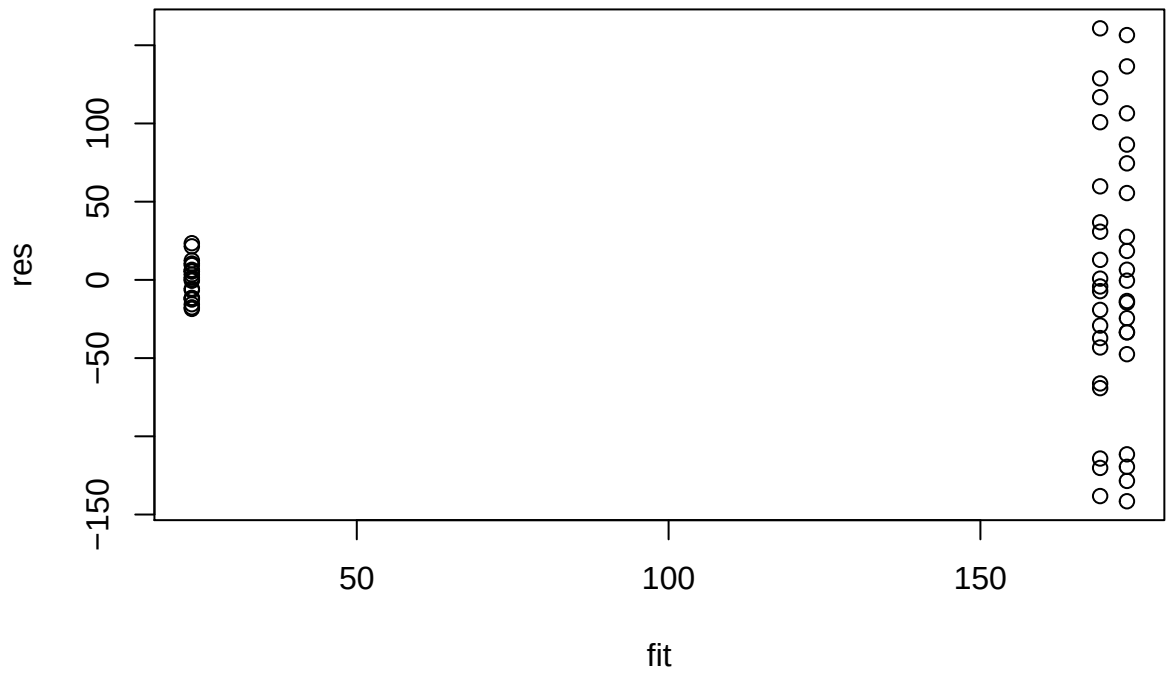


Vi ser at den mindste observerede værdi ligger knapt under 50 for kontrolgruppen...

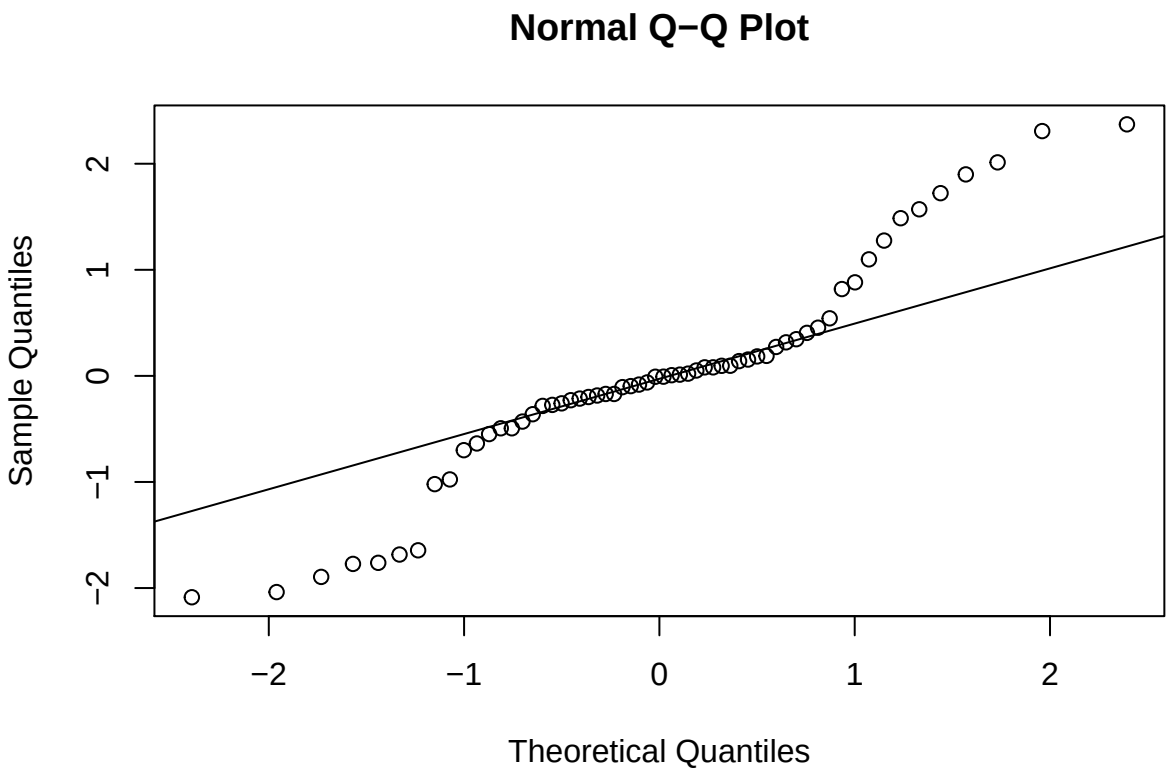
vi fitter modellen, for et sidet variansanalyse;

```
lm <- lm(pillbug$time ~ pillbug$group)
fit <- fitted(lm)
res <- residuals(lm)
rstad <- rstandard(lm)

plot(fit, res)
```




```
qqnorm(rstad)
qqline(rstad)
```



vi finder at der ikke er varians homogentitet, da observationerne på venstre side har mindre varians end de to på højre siden (punkternes-linjes højde)

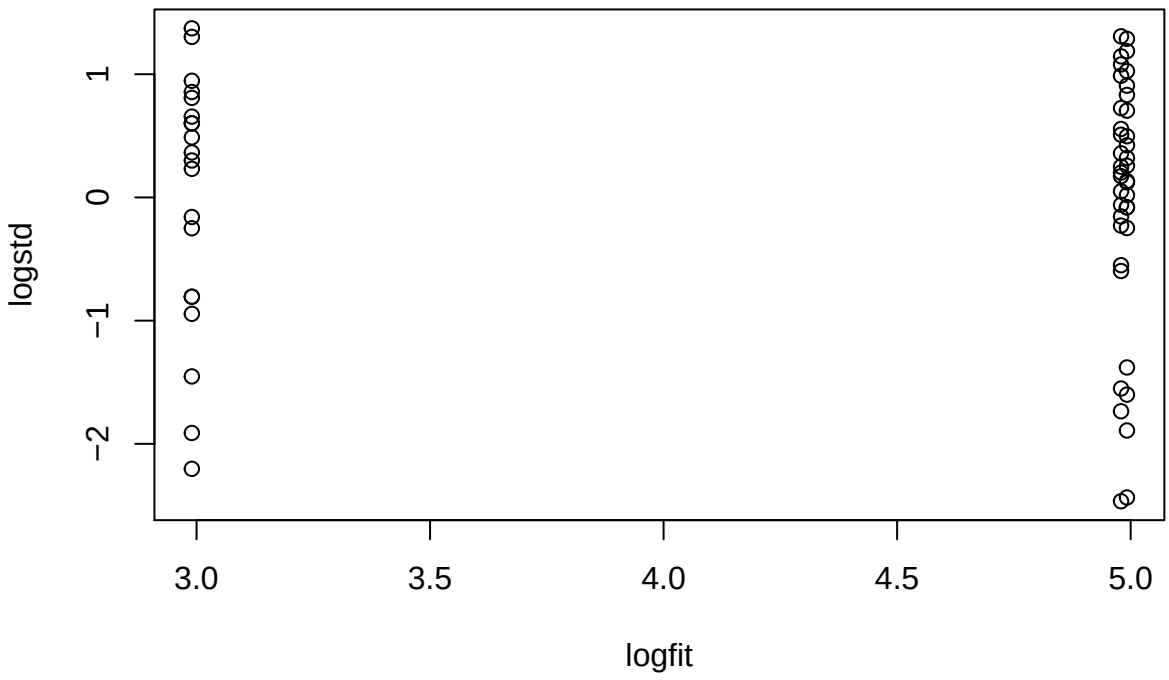
3

```
logtime <- log(pillbug$time)
```

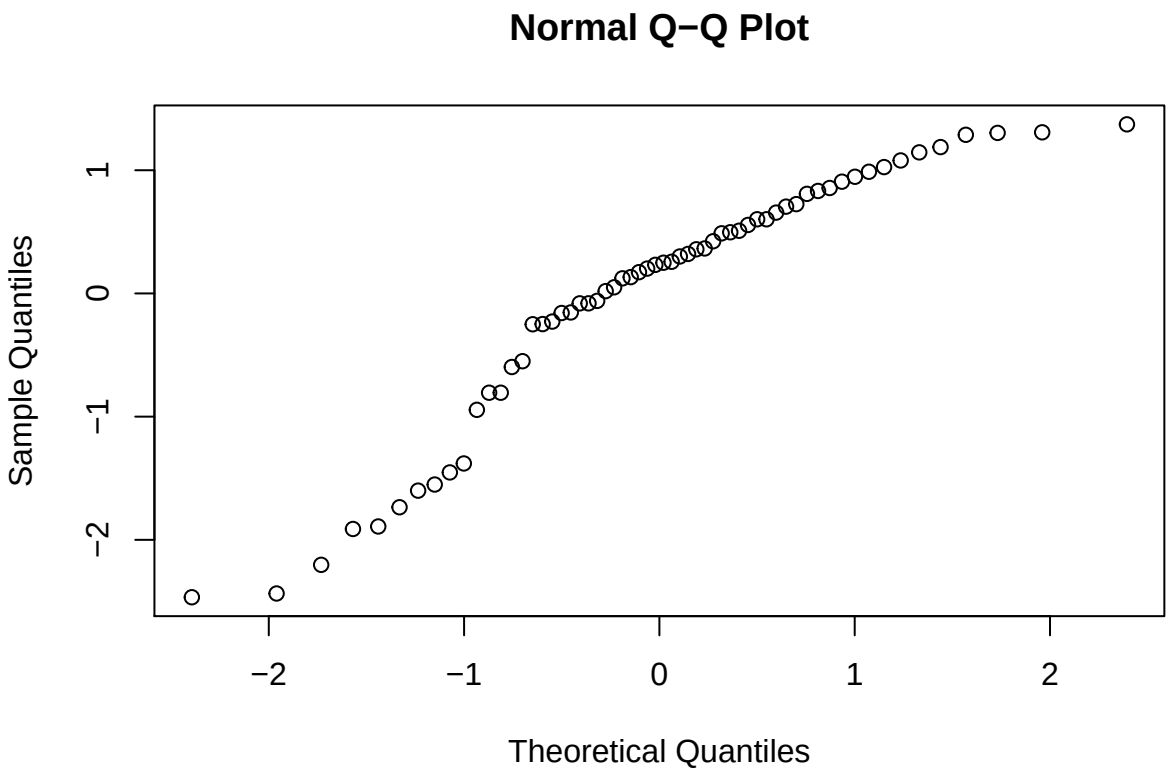
vi gentager

```
loglm <- lm(logtime~pillbug$group)
logfit <- fitted(loglm)
logstd <-rstandard(loglm)

plot(logfit, logstd)
```




```
qqnorm(logstd)
```



modellen ser mere fornuftigt ud.

det hjælper at log transformere, da

4

hypotesen er at middelværdien i de tre grupper er ens, vi bruger log(tid), da vi i de forgående spørgsmål fandt at den opfylder varianshomogenitet og normalfordelingsantagelsen.

```
logModel0 <- lm(logtime ~ 1)
summary(logModel0)
```

```
##
## Call:
## lm(formula = logtime ~ 1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.7110 -0.8947  0.5158  0.8969  1.4786
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.3205     0.1472   29.36   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 1.14 on 59 degrees of freedom
```

```
anova(logModel0, loglm)
```

```
## Analysis of Variance Table
##
## Model 1: logtime ~ 1
## Model 2: logtime ~ pillbug$group
##   Res.Df    RSS Df Sum of Sq      F    Pr(>F)
## 1     59 76.677
## 2     57 23.567  2     53.11 64.227 2.498e-15 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```