

ass3

```
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.3.1 --

## v ggplot2 3.3.5    v purrr  0.3.4
## v tibble  3.1.4    v dplyr  1.0.7
## v tidyr   1.1.3    v stringr 1.4.0
## v readr   2.0.1    v forcats 0.5.1

## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()

library(xlsx)
data <- read.xlsx("~/Desktop/204 R/LEADMOSS.xlsx",sheetIndex = 1)

y=data$LEAD
x1=data$ELEVATION
x2=data$SLOPE
mod1=lm(y~x1*x2)
summary(mod1)

##
## Call:
## lm(formula = y ~ x1 * x2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.9695 -2.9344 -1.0941  0.2766 22.1018
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  5.0701418  6.2503485   0.811   0.421
## x1           0.0007367  0.0024516   0.301   0.765
## x2          -0.8796772  8.5747512  -0.103   0.919
## x1:x2         0.0003999  0.0033833   0.118   0.906
##
## Residual standard error: 5.338 on 56 degrees of freedom
## Multiple R-squared:  0.005896, Adjusted R-squared:  -0.04736
## F-statistic: 0.1107 on 3 and 56 DF, p-value: 0.9535

library(psych)
```

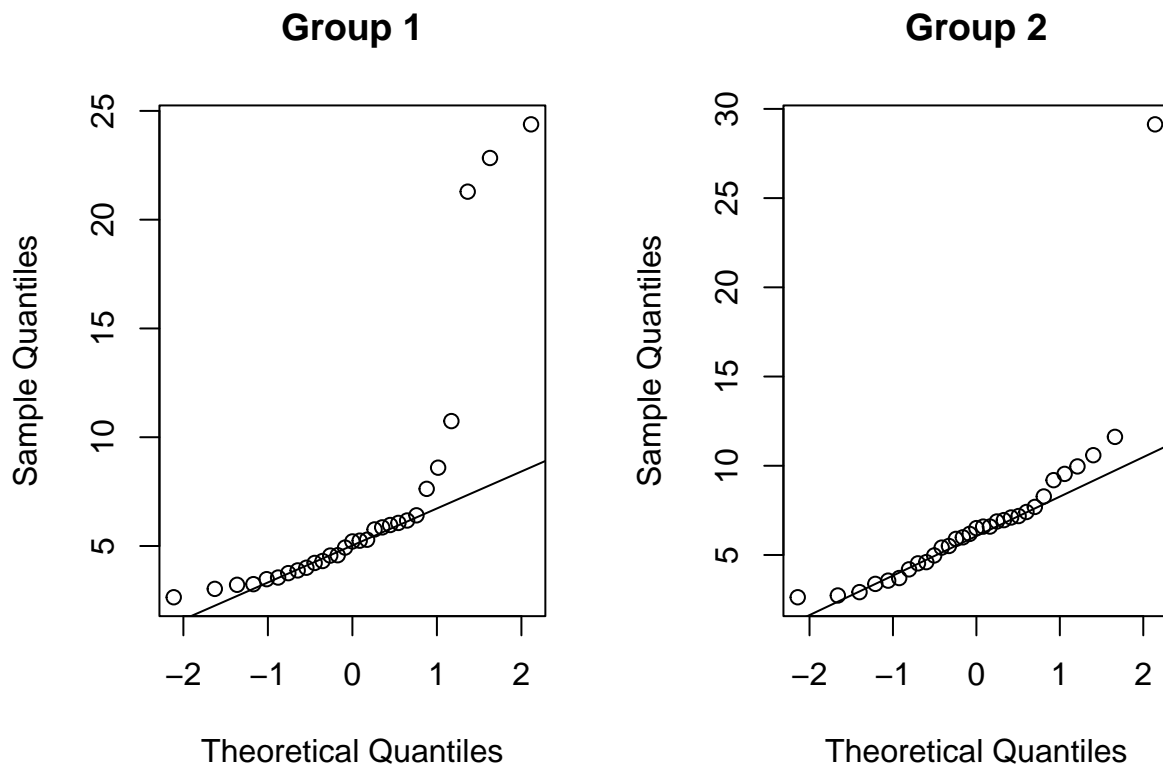
```
##
## Attaching package: 'psych'

## The following objects are masked from 'package:ggplot2':
##
##   %+%, alpha

x2.factor=factor(x2)
describeBy(y,x2.factor)

##
## Descriptive statistics by group
## group: 0
##   vars  n mean   sd median trimmed  mad  min   max range skew kurtosis   se
## X1     1 29 6.92 5.78   5.21   5.92 1.79 2.64 24.38 21.74 2.12     3.21 1.07
## -----
## group: 1
##   vars  n mean   sd median trimmed  mad  min   max range skew kurtosis   se
## X1     1 31 7.01 4.72   6.5   6.31 2.63 2.63 29.13 26.5 3.25    12.71 0.85

par(mfrow=c(1,2))
qqnorm(subset(y,x2.factor==0),main="Group 1")
qqline(subset(y,x2.factor==0))
qqnorm(subset(y,x2.factor==1),main="Group 2")
qqline(subset(y,x2.factor==1))
```

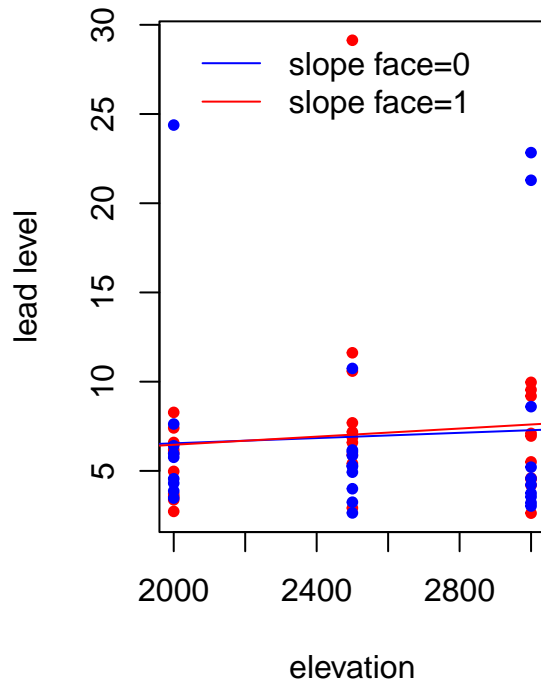


```

plot(x=data$ELEVATION[data$SLOPE==1],y=data$LEAD[data$SLOPE==1],xlab="elevation",ylab="lead level",col=
lines(x=data$ELEVATION[data$SLOPE==0],y=data$LEAD[data$SLOPE==0],col="blue",pch=20,type='p')
abline(a=5.0701418,b=0.0007367,col="blue")
abline(a=4.190465,b=0.0011366,col="red")

legend(2000,30,legend=c("slope face=0","slope face=1"),col=c("blue","red"),lty=c(1,1),bty="n")

```



```
anova(mod1)
```

```

## Analysis of Variance Table
##
## Response: y
##          Df Sum Sq Mean Sq F value Pr(>F)
## x1         1    8.85   8.8492   0.3105 0.5796
## x2         1    0.22   0.2181   0.0077 0.9306
## x1:x2       1    0.40   0.3982   0.0140 0.9063
## Residuals 56 1595.83 28.4970

```

```
t=lm(y~y)
```

```

## Warning in model.matrix.default(mt, mf, contrasts): the response appeared on the
## right-hand side and was dropped

```

```

## Warning in model.matrix.default(mt, mf, contrasts): problem with term 1 in
## model.matrix: no columns are assigned

```

```
t1=lm(y~x1)
t2=lm(y~x2)
t3=lm(y~x1+x2)
t4=lm(y~x1*x2)
summary(t)
```

```
##
## Call:
## lm(formula = y ~ y)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.3398 -2.8252 -1.1627  0.2672 22.1633
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   6.9707      0.6734   10.35 6.94e-15 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.216 on 59 degrees of freedom
```

```
summary(t1)
```

```
##
## Call:
## lm(formula = y ~ x1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.810 -2.918 -1.093  0.338 22.163
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  4.6190000  4.2026043   1.099   0.276
## x1           0.0009407  0.0016591   0.567   0.573
##
## Residual standard error: 5.246 on 58 degrees of freedom
## Multiple R-squared:  0.005512, Adjusted R-squared: -0.01163
## F-statistic: 0.3215 on 1 and 58 DF, p-value: 0.5729
```

```
summary(t2)
```

```
##
## Call:
## lm(formula = y ~ x2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.3828 -2.8461 -1.1383  0.2242 22.1202
##
```

```
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  6.92469    0.97690   7.088 2.08e-09 ***
## x2           0.08915    1.35908   0.066  0.948
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.261 on 58 degrees of freedom
## Multiple R-squared:  7.418e-05, Adjusted R-squared:  -0.01717
## F-statistic: 0.004303 on 1 and 58 DF, p-value: 0.9479
```

```
summary(t3)
```

```
##
## Call:
## lm(formula = y ~ x1 + x2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.8715 -2.9213 -1.0907  0.2796 22.1049
##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept) 4.5415238  4.3289852   1.049  0.299
## x1           0.0009467  0.0016748   0.565  0.574
## x2           0.1207421  1.3682614   0.088  0.930
##
## Residual standard error: 5.292 on 57 degrees of freedom
## Multiple R-squared:  0.005648, Adjusted R-squared:  -0.02924
## F-statistic: 0.1619 on 2 and 57 DF, p-value: 0.8509
```

```
summary(t4)
```

```
##
## Call:
## lm(formula = y ~ x1 * x2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.9695 -2.9344 -1.0941  0.2766 22.1018
##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  5.0701418  6.2503485   0.811  0.421
## x1           0.0007367  0.0024516   0.301  0.765
## x2          -0.8796772  8.5747512  -0.103  0.919
## x1:x2         0.0003999  0.0033833   0.118  0.906
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```

```
moda=lm(y~x1*x2)
modb=update(modb,.~-x1:x2)
anova(modb,moda)
```

```
## Analysis of Variance Table
##
## Model 1: y ~ x1 + x2
## Model 2: y ~ x1 * x2
##   Res.Df    RSS Df Sum of Sq    F Pr(>F)
## 1      57 1596.2
## 2      56 1595.8  1   0.39822 0.014 0.9063
```

```
modc=update(modb,.~-x1)
anova(modc,modb)
```

```
## Analysis of Variance Table
##
## Model 1: y ~ x2 + x1:x2
## Model 2: y ~ x1 + x2
##   Res.Df    RSS Df Sum of Sq F Pr(>F)
## 1      57 1598.4
## 2      57 1596.2  0    2.1753
```

```
modd=update(modb,.~-x2)
anova(modd,modb)
```

```
## Analysis of Variance Table
##
## Model 1: y ~ x1 + x1:x2
## Model 2: y ~ x1 + x2
##   Res.Df    RSS Df Sum of Sq F Pr(>F)
## 1      57 1596.1
## 2      57 1596.2  0   -0.0983
```

```
mode=update(modd,.~-x1)
anova(mode,modd)
```

```
## Analysis of Variance Table
##
## Model 1: y ~ x1:x2
## Model 2: y ~ x1 + x1:x2
##   Res.Df    RSS Df Sum of Sq    F Pr(>F)
## 1      58 1604.4
## 2      57 1596.1  1    8.2846 0.2959 0.5886
```