

# Homework 7

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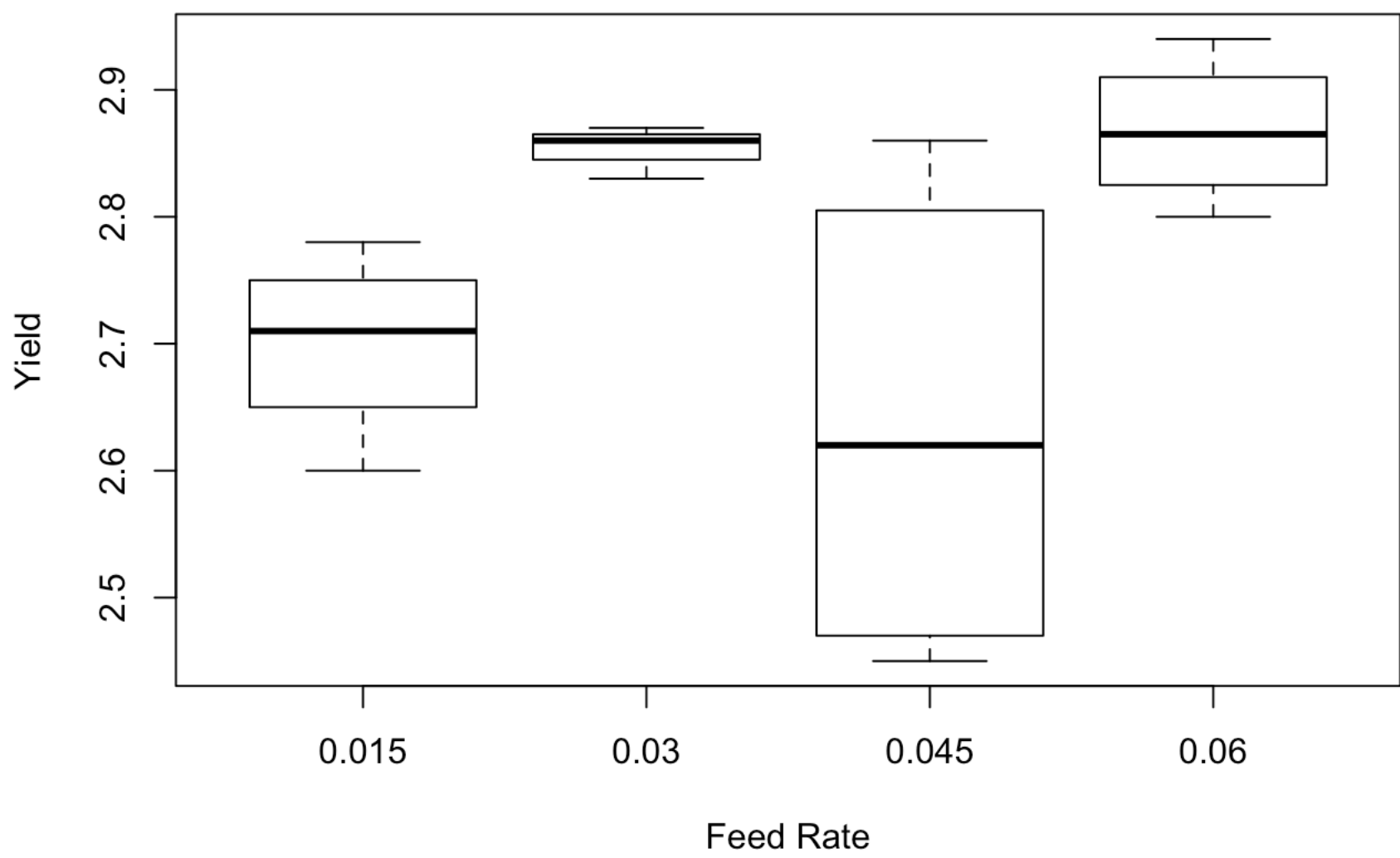
10/26/2020

##Q5.14: Entering the data

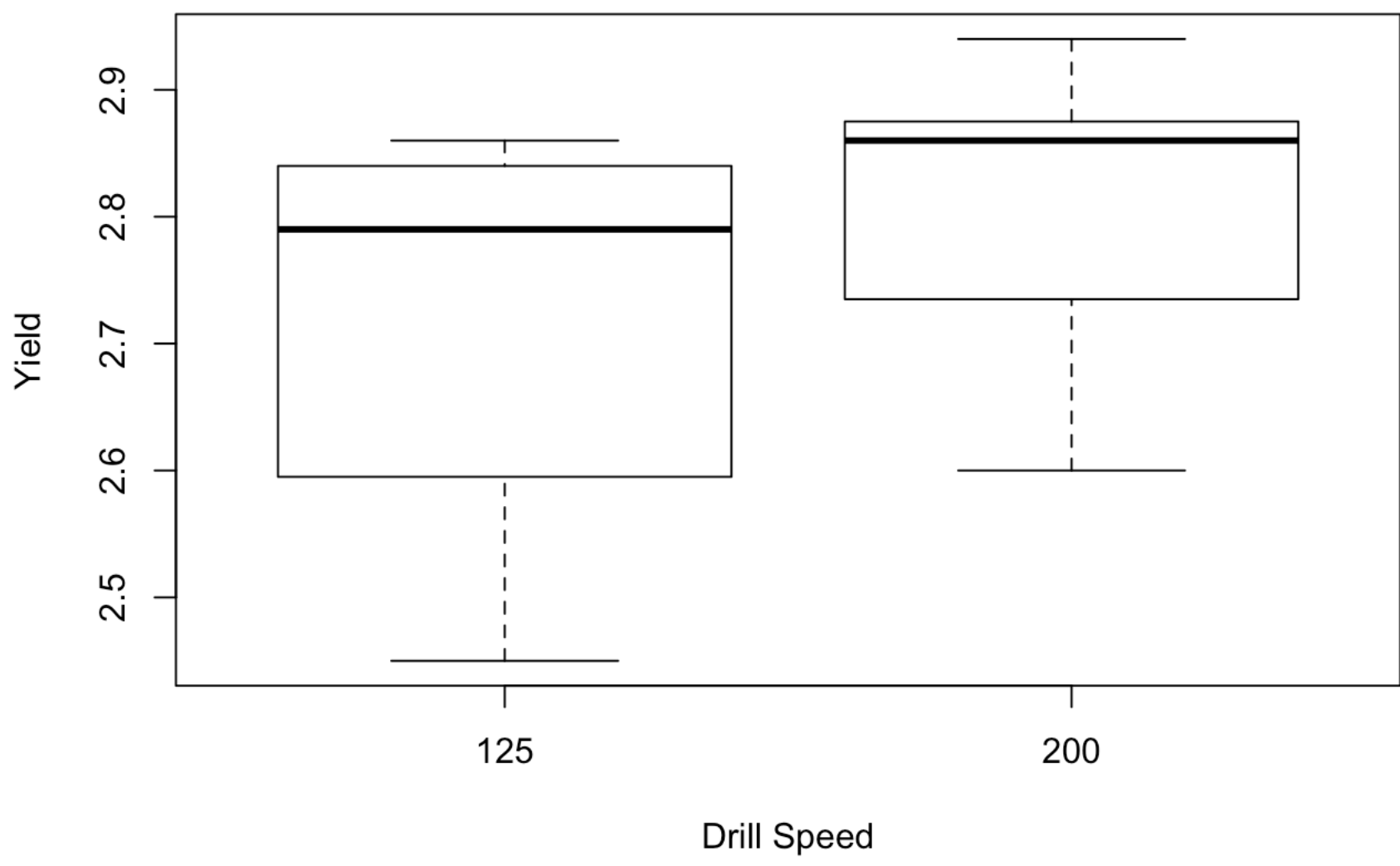
```
yijk=c(2.70, 2.78, 2.83, 2.86, 2.45, 2.49, 2.85, 2.80, 2.60, 2.72, 2.86, 2.87, 2.75, 2.86, 2.94, 2.88)
feed.rate=as.factor(rep(c(0.015, 0.015, 0.030, 0.030, 0.045, 0.045, 0.060, 0.060), 2))
drill.speed=as.factor(c(rep(125,8), rep(200,8)))
```

##Question 3 ## Exploratory Plots

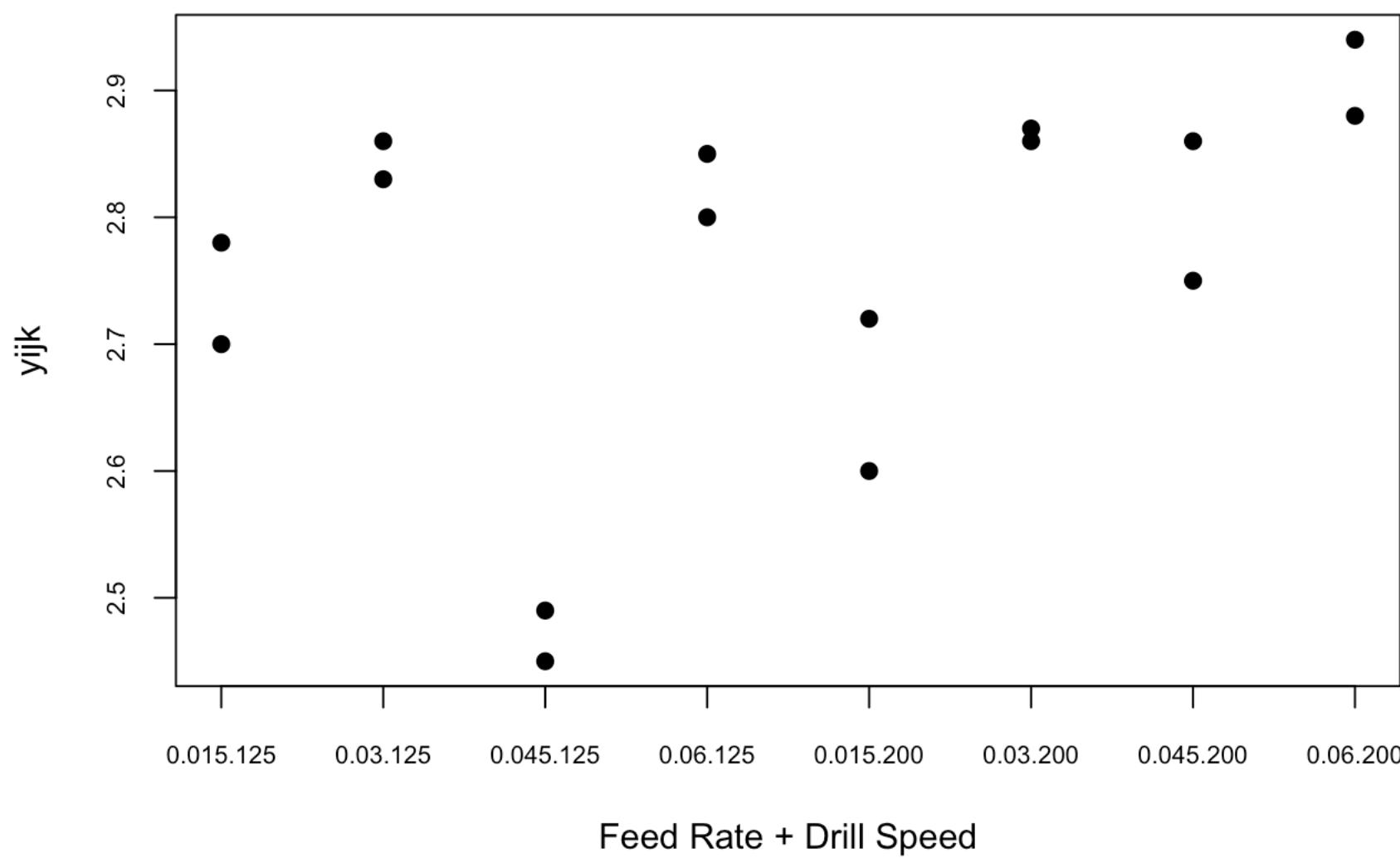
```
plot(feed.rate, yijk, xlab="Feed Rate", ylab="Yield")
```



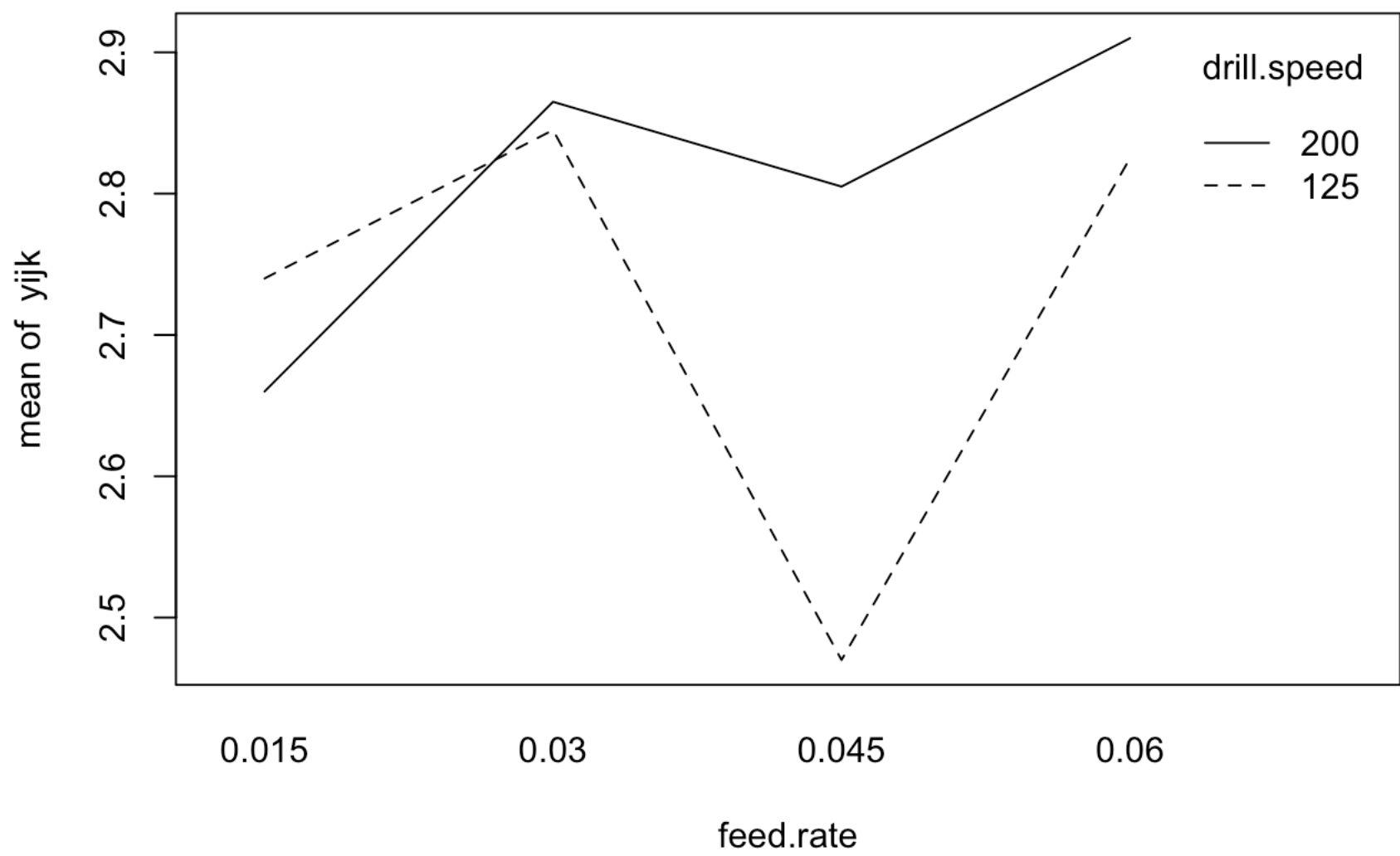
```
plot(drill.speed,yijk,xlab="Drill Speed", ylab="Yield")
```



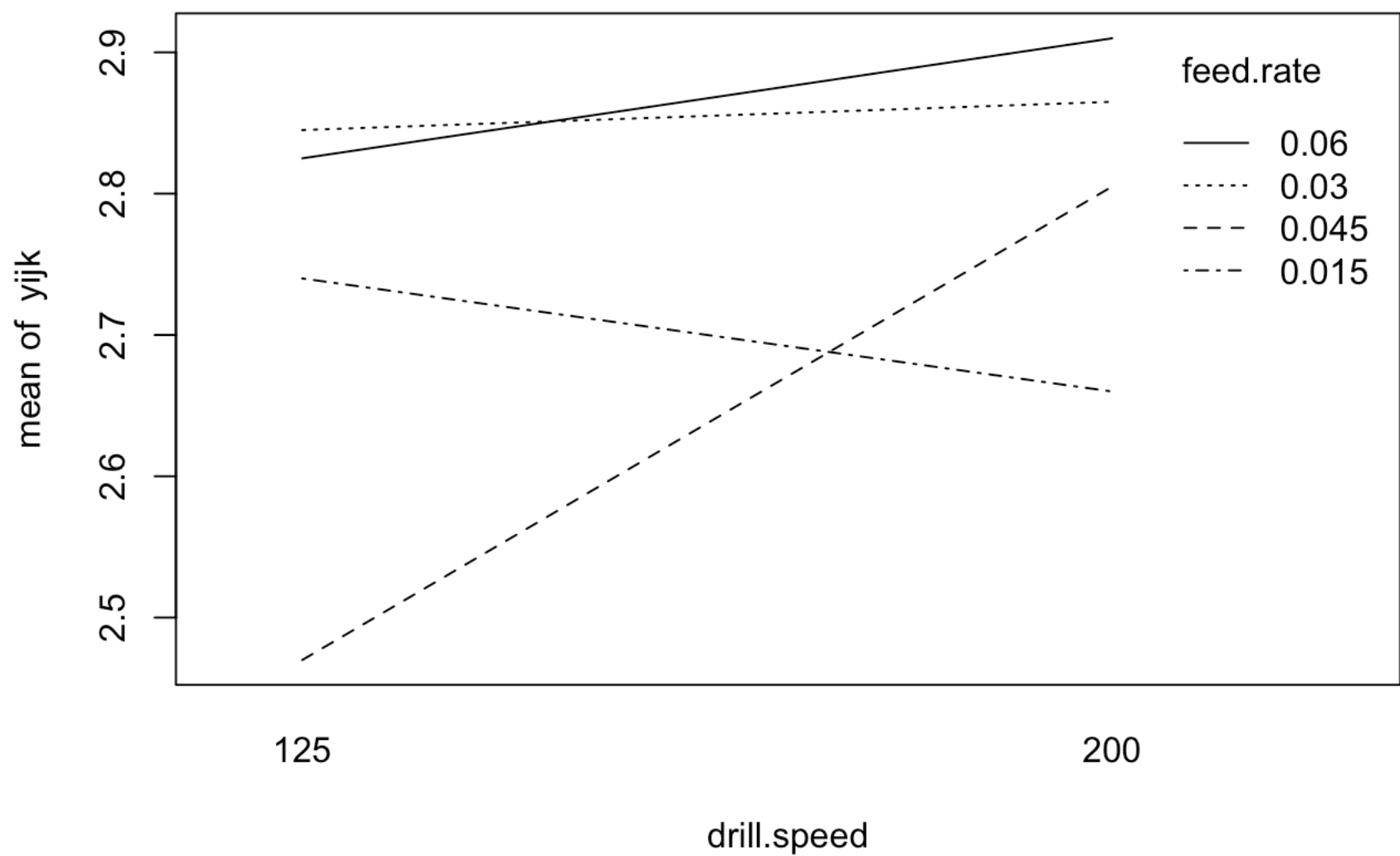
```
#Stripchart
stripchart(yijk~feed.rate+drill.speed,vertical=T,xlab="Feed Rate + Drill Speed", cex.lab=1, pch=19,cex.axis=0.7)
```



```
#Interactions
interaction.plot(feed.rate, drill.speed, yijk)
```



```
interaction.plot(drill.speed,feed.rate, yijk)
```



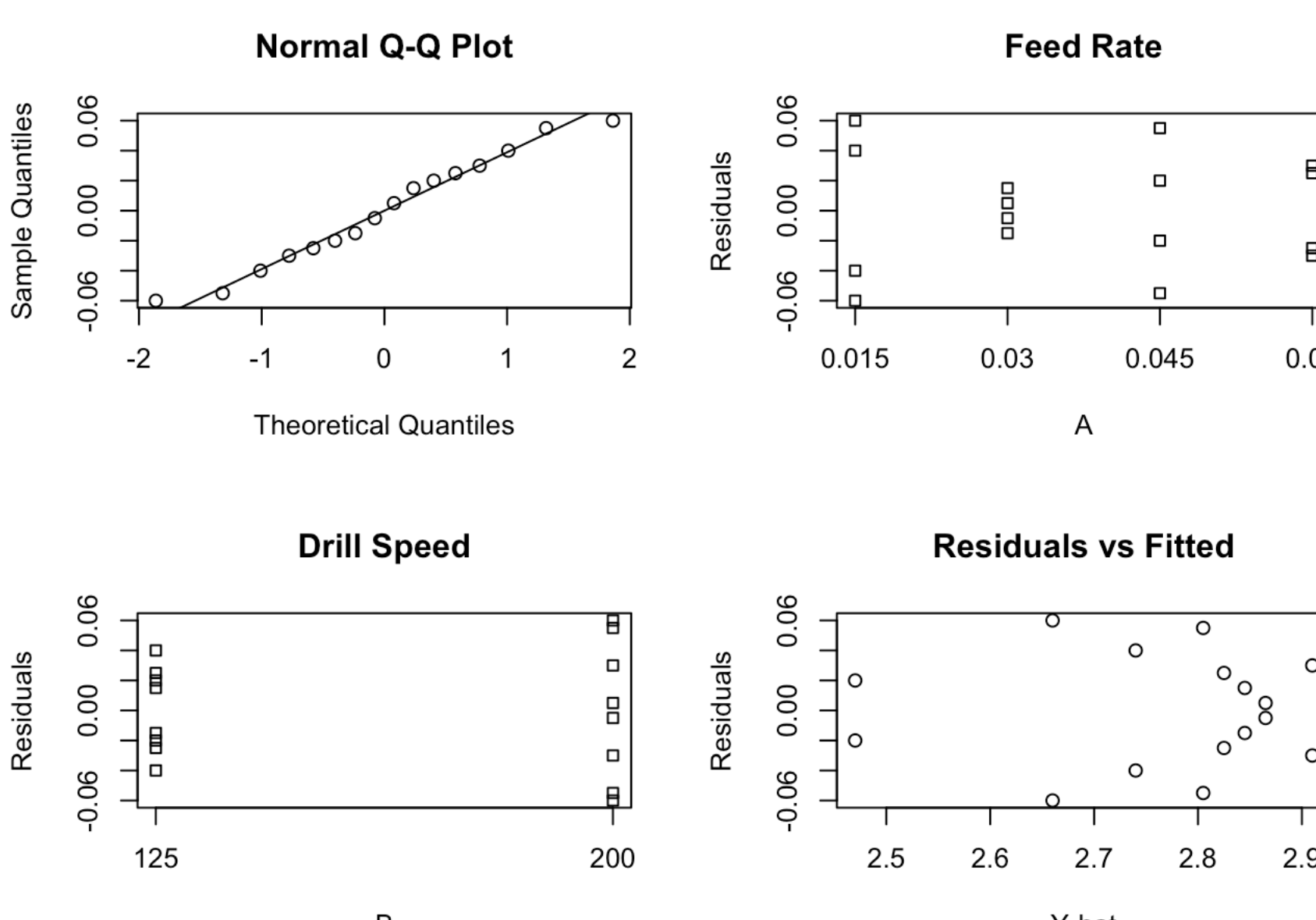
##ANOVA Tests

```
twoway=aov(yijk~feed.rate+drill.speed+feed.rate*drill.speed)
summary(twoway)
```

```
##              Df Sum Sq Mean Sq F value    Pr(>F)    
## feed.rate      3  0.15635  0.05212    20.05 0.000445 ***
## drill.speed    1  0.03240  0.03240    12.46 0.007731 ** 
## feed.rate:drill.speed  3  0.09385  0.03128    12.03 0.002465 **
## Residuals      8  0.02080  0.00260                      
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

## Diagnostic Plots for the residuals

```
fits=twoway$fitted
res=twoway$residuals
par(mfrow=c(2,2))
qqnorm(res)
qqline(res)
stripchart(res~feed.rate,vertical=T,xlab="A",ylab="Residuals", main="Feed Rate")
stripchart(res~drill.speed,vertical=T,xlab="B",ylab="Residuals", main="Drill Speed")
plot(fits,res,xlab="Y-hat",ylab="Residuals", main="Residuals vs Fitted")
```



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

## Obtaining point estimates of the effects

```
model.tables(twoway, "effects")
```

```
## Tables of effects
##
## feed.rate
## feed.rate
## 0.015 0.03 0.045 0.06
## -0.0650 0.0900 -0.1275 0.1025
##
## drill.speed
## drill.speed
## 125 200
## -0.045 0.045
##
## feed.rate:drill.speed
## drill.speed
## feed.rate 125 200
## 0.015 0.0850 -0.0850
## 0.03 0.0350 -0.0350
## 0.045 -0.1225 0.1225
## 0.06 0.0025 -0.0025
```