

# pig feed

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January 20, 2016

pig feed

reference:

- Cannon, et al., chapter 6, ex. 6.4

Import the data.

```
data <- read.table("PigFeed.csv", header=TRUE, sep=",")
head(data, 4)
```

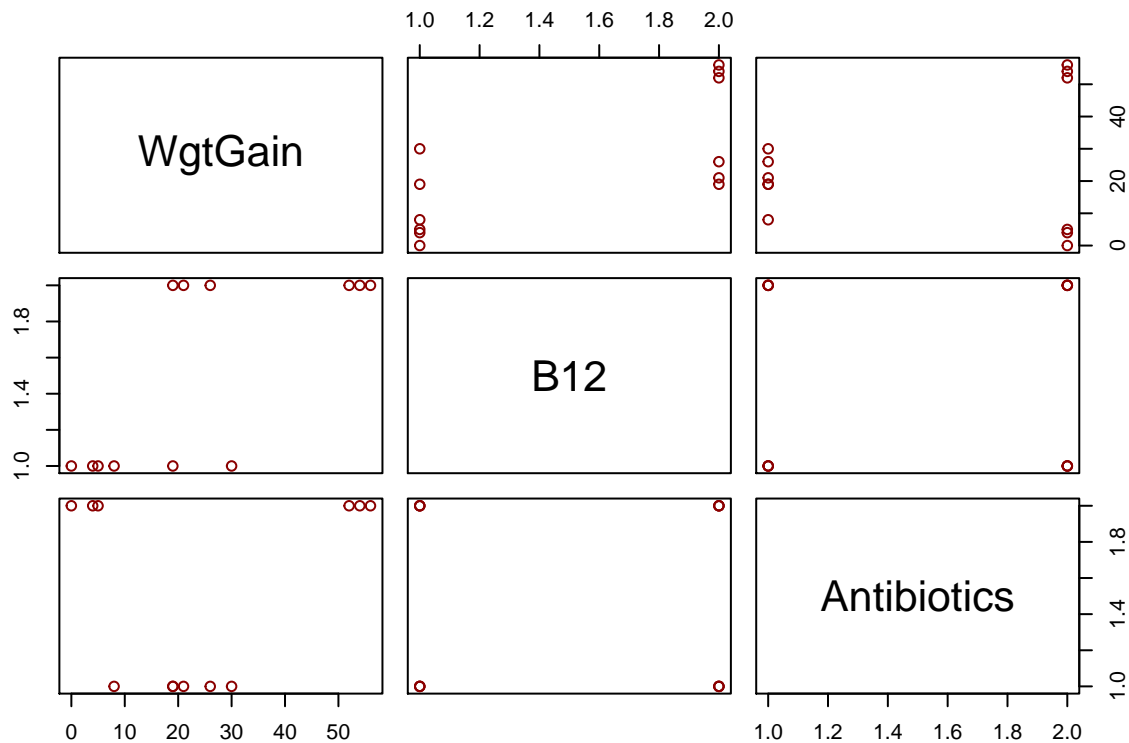
```
##   WgtGain B12 Antibiotics
## 1     30 No           No
## 2      8 No           No
## 3     19 No           No
## 4      5 No           Yes
```

```
dim(data)
```

```
## [1] 12 3
```

Scatterplot matrix.

```
pairs(~ WgtGain + B12 + Antibiotics, data=data,
      col="darkred")
```



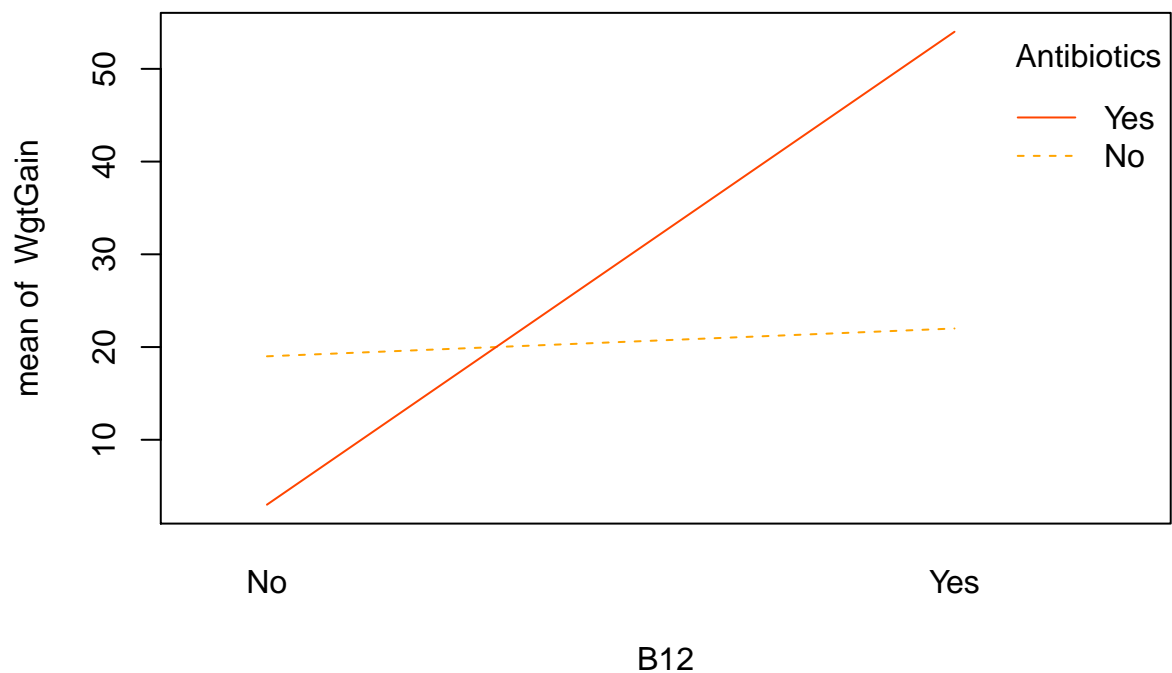
2x2 contingency table.

```
pig.table <- with(data,
  tapply(WgtGain, list(Antibiotics, B12), mean))
dimnames(pig.table) = list(antibiotics = c("yes", "no"),
  B12 = c("yes", "no"))
pig.table
```

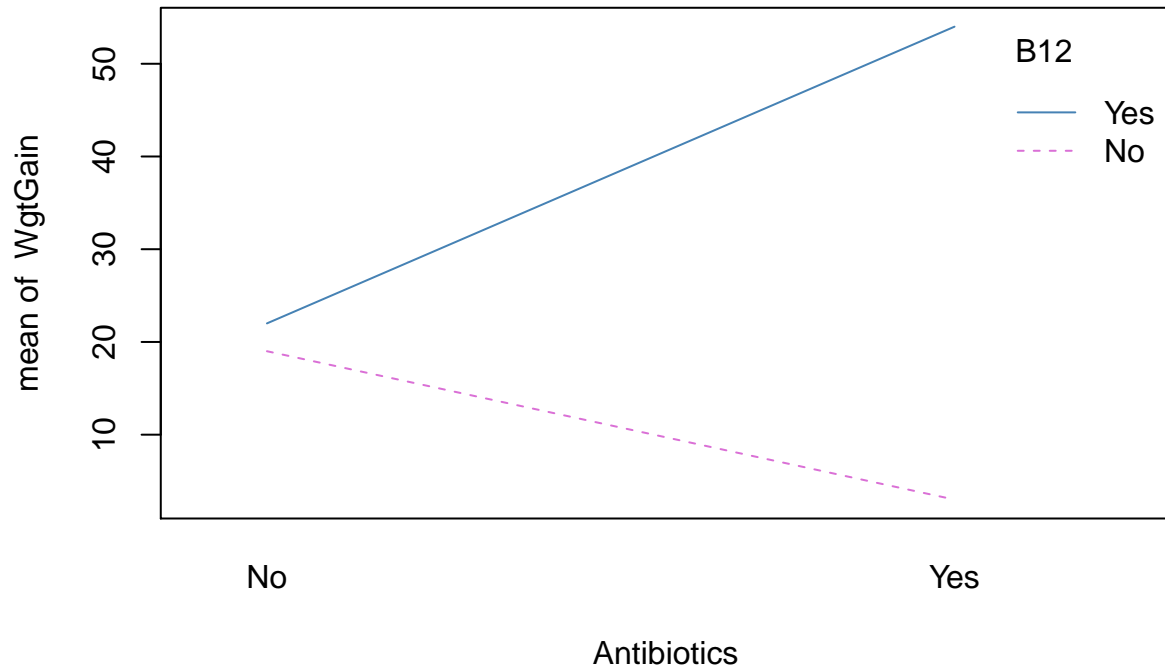
```
##           B12
## antibiotics yes no
##           yes 19 22
##           no   3 54
```

Interaction plots.

```
with(data,
  interaction.plot(B12, Antibiotics, WgtGain,
    col=c("orange", "orangered")))
```



```
with(data,
  interaction.plot(Antibiotics, B12, WgtGain,
    col=c("orchid", "steelblue")))
```



Two-way ANOVA without interaction.

```
PigFeed.aov1 <- with(data,
                      aov(WgtGain ~ Antibiotics + B12))
options(show.signif.stars=FALSE)
summary(PigFeed.aov1)
```

```
##           Df Sum Sq Mean Sq F value Pr(>F)
## Antibiotics  1    192   192.0    0.856 0.3789
## B12          1   2187  2187.0    9.754 0.0123
## Residuals   9   2018   224.2
```

Two-way ANOVA with interaction.

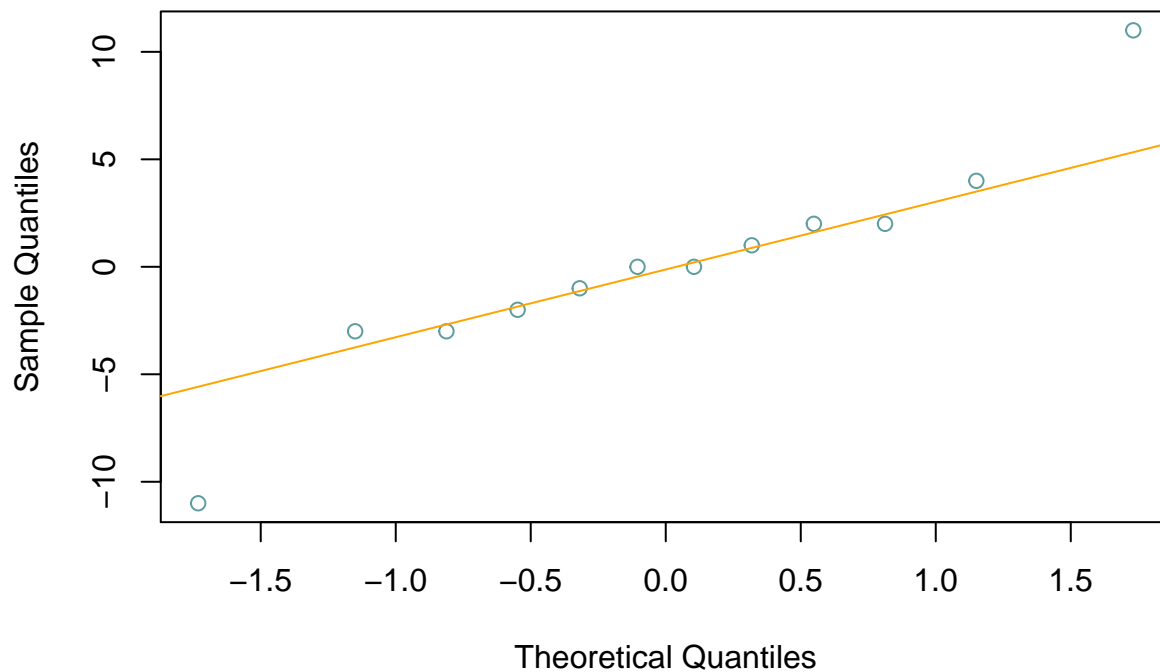
```
PigFeed.aov2 <- with(data,
                      aov(WgtGain ~ Antibiotics*B12))
summary(PigFeed.aov2)
```

```
##           Df Sum Sq Mean Sq F value    Pr(>F)
## Antibiotics  1    192   192.0    5.297 0.050359
## B12          1   2187  2187.0   60.331 5.4e-05
## Antibiotics:B12  1   1728  1728.0   47.669 0.000124
## Residuals    8    290    36.3
```

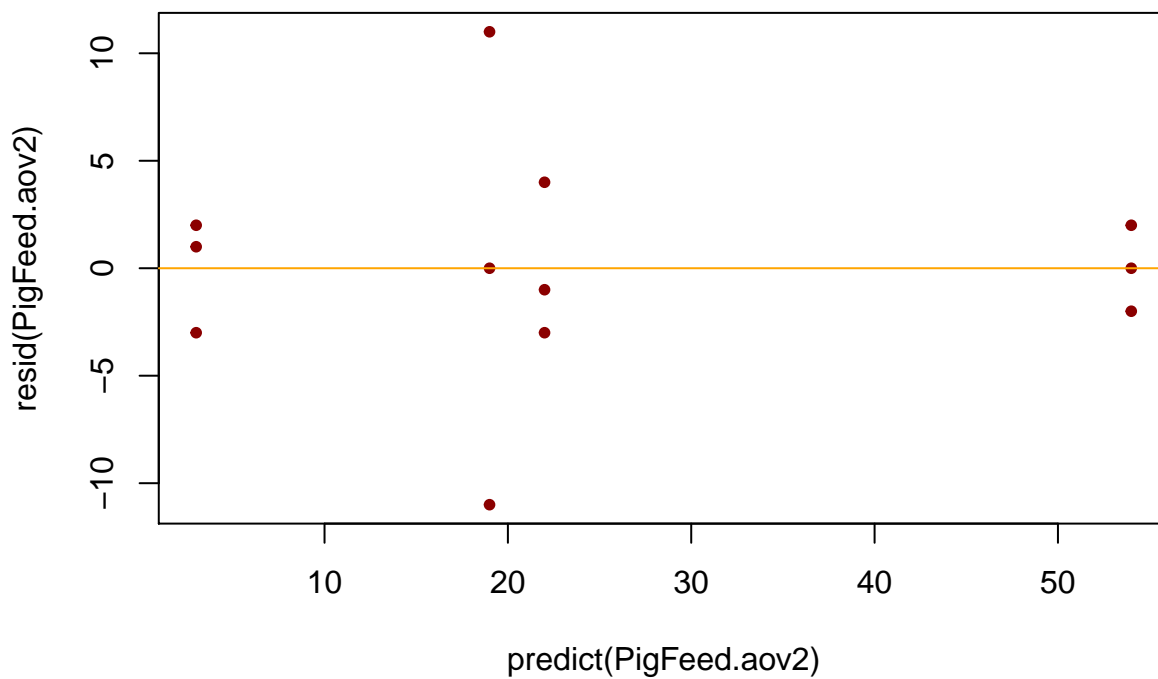
Residuals.

```
qqnorm(resid(PigFeed.aov2), col="cadetblue")
qqline(resid(PigFeed.aov2), col="orange")
```

## Normal Q-Q Plot



```
plot(predict(PigFeed.aov2), resid(PigFeed.aov2),  
      pch=20, col="darkred")  
abline(h=0, col="orange")
```



Difference of means: control diet vs. diet with Antibiotics and B12

$$\bar{y}_{22} - \bar{y}_{11} \pm \sqrt{MSE\left(\frac{1}{n_{22}} + \frac{1}{n_{11}}\right)}$$

CI does not contain 0, so the two means are statistically distinct.

```

y.both <- 54 # from pig.table
y.control <- 19
point.estimate <- y.both - y.control
alpha <- 0.05
df <- 8 # from aov
t.star <- qt(c(alpha/2, 1 - alpha/2), df=df)
mse <- 36.3 # from aov
se <- sqrt(mse * 2 / 3)
ci <- point.estimate + t.star * se
ci

```

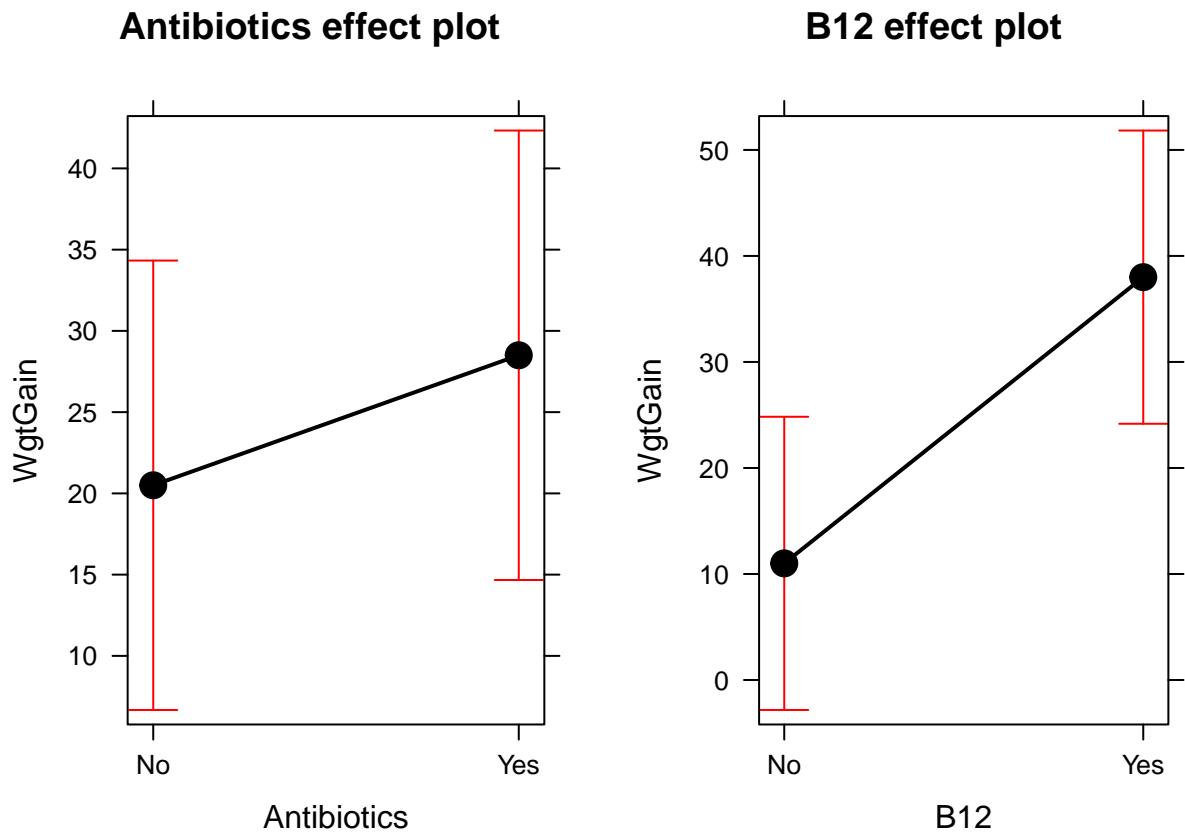
```
## [1] 23.65596 46.34404
```

Effect plots: without interaction.

```

pigfeed.lm1 <- lm(WgtGain ~ Antibiotics + B12, data=data)
library(alr4)
plot(allEffects(pigfeed.lm1))

```



Effect plots: with interaction.

```
pigfeed.lm2 <- lm(WgtGain ~ Antibiotics*B12, data=data)
plot(allEffects(pigfeed.lm2))
```

### Antibiotics\*B12 effect plot

