

EDDA - Assignment 1

Exercise 5

a)

Test whether the distributions of the chicken weights for meatmeal and sunflower groups are different by performing three tests: the two samples t-test (argue whether the data are paired or not), the Mann-Whitney test and the Kolmogorov-Smirnov test. Comment on your findings.

```
# filter for meatmeal

meatmeal <- chickwts %>%
  filter(feed == "meatmeal") %>%
  select(weight)

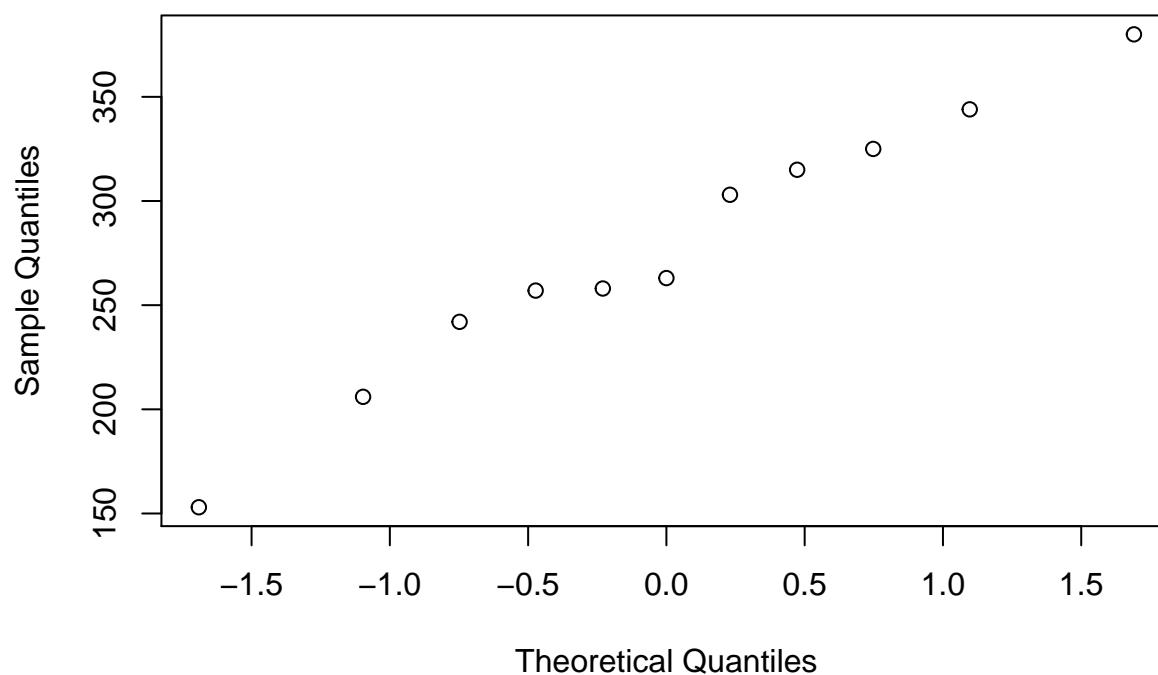
# filter for sunflower

sunflower <- chickwts %>%
  filter(feed == "sunflower") %>%
  select(weight)

# check for data normality

qqnorm(meatmeal$weight)
qqnorm(sunflower$weight)
```

Normal Q-Q Plot



```
# perform t-test, the data is not paired
```

```
t.test(meatmeal, sunflower)
```

```
##  
## Welch Two Sample t-test  
##  
## data: meatmeal and sunflower  
## t = -2.1564, df = 18.535, p-value = 0.04441  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -102.572435 -1.442716  
## sample estimates:  
## mean of x mean of y  
## 276.9091 328.9167
```

```
# Mann-Whitney test
```

```
wilcox.test(meatmeal$weight, sunflower$weight)
```

```
##  
## Wilcoxon rank sum exact test  
##  
## data: meatmeal$weight and sunflower$weight  
## W = 36, p-value = 0.06882  
## alternative hypothesis: true location shift is not equal to 0
```

```
# Kolmogorov-Smirnov test

ks.test(meatmeal$weight, sunflower$weight)

##
## Two-sample Kolmogorov-Smirnov test
##
## data: meatmeal$weight and sunflower$weight
## D = 0.47727, p-value = 0.1085
## alternative hypothesis: two-sided
```

Data in chickwts is not paired as the “treatment” of different feed was applied to different newly-hatched chicks not the same chick. From t-test we can see that the p-values < 0.05 , therefore the means between the two groups are significantly different. From Mann-Whitney test we can see that p-value is > 0.05 therefore we can not conclude that the medians of the two datasets are different. From Kolmogorov-Smirnov test we can not conclude that the means are different.

b)

Conduct a one-way ANOVA to determine whether the type of feed supplement has an effect on the weight of the chicks. Give the estimated chick weights for each of the six feed supplements. What is the best feed supplement?

```
chickaov <- lm(weight~feed, data = chickwts)
# performing one-way ANOVA
anova(chickaov)

## Analysis of Variance Table
##
## Response: weight
##          Df Sum Sq Mean Sq F value    Pr(>F)
## feed      5 231129   46226  15.365 5.936e-10 ***
## Residuals 65 195556     3009
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#extracting more information
summary_table <- summary(chickaov)
summary_table$coefficients
```

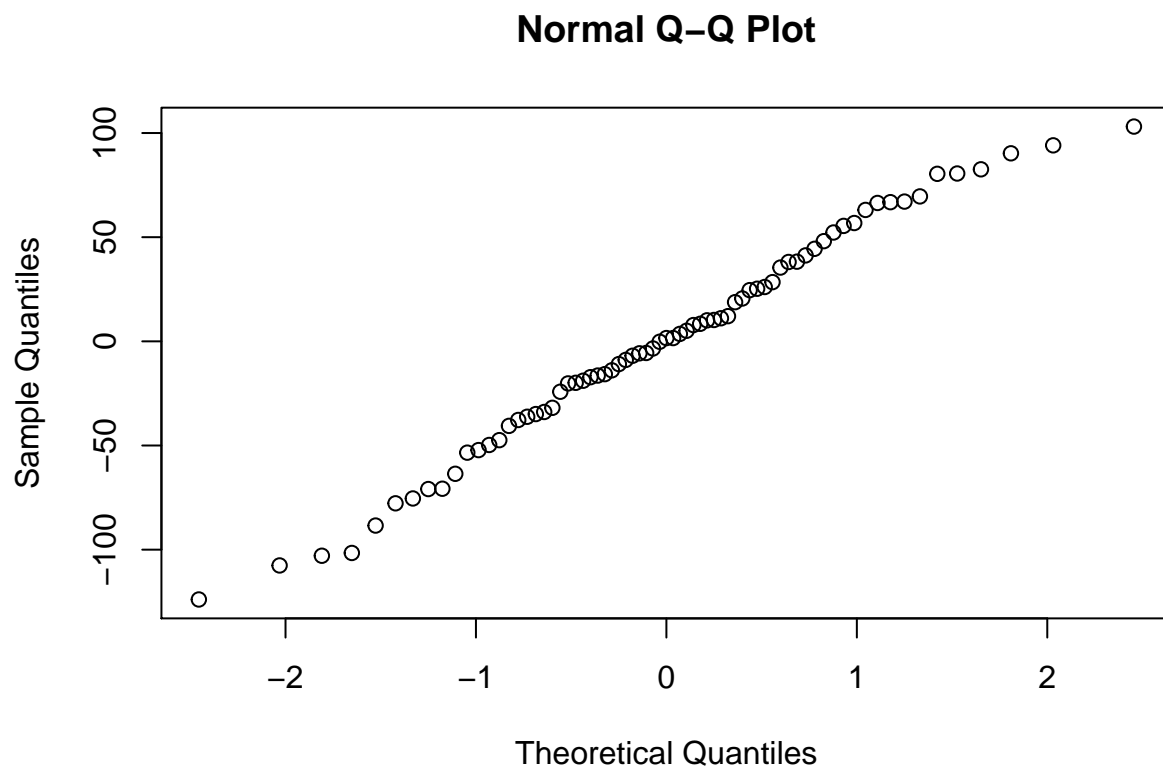
```
##          Estimate Std. Error    t value    Pr(>|t|)
## (Intercept)  323.583333   15.83391  20.4360920 5.325090e-30
## feedhorsebean -163.383333   23.48549  -6.9567776 2.067997e-09
## feedlinseed  -104.833333   22.39254  -4.6816194 1.493344e-05
## feedmeatmeal  -46.674242   22.89580  -2.0385502 4.556672e-02
## feedsoybean   -77.154762   21.57799  -3.5756235 6.654079e-04
## feedsunflower   5.333333   22.39254   0.2381746 8.124949e-01
```

From the results of one-way ANOVA we can see that the p-values is < 0.05 therefore we can conclude that the means between all of the feed varieties are significantly different. From summary statistics it seems that “sunflower” feed is the feed resulting in highest weight. therefore it is the best.

c)

Check the ANOVA model assumptions by using relevant diagnostic tools.

```
# check for normality
qqnorm(chickaov$residuals)
```



```
# check if the variances are equal
chickwts %>%
  group_by(feed) %>%
  summarise(variance = var(weight))
```

```
## # A tibble: 6 x 2
##   feed      variance
## * <fct>      <dbl>
## 1 casein      4152.
## 2 horsebean   1492.
## 3 linseed     2729.
## 4 meatmeal    4212.
## 5 soybean     2930.
## 6 sunflower   2385.
```

From qqplot assumption of normality holds. However the assumption of equal variances does not hold.

d)

Does the Kruskal-Wallis test arrive at the same conclusion about the effect of feed supplement as the test in b)? Explain possible differences between conclusions of the Kruskal-Wallis and ANOVA tests.

```
kruskal.test(weight~feed, data = chickwts)
```

```
##  
##  Kruskal-Wallis rank sum test  
##  
## data:  weight by feed  
## Kruskal-Wallis chi-squared = 37.343, df = 5, p-value = 5.113e-07
```

With Kruskal-Wallis test we arrive to the same conclusion as with ANOVA.