Homework 09

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STAT 641-720

1) a) matched pairs
   b) independent samples
   c) independent samples
   d) matched pairs

2)

a) There is not enough evidence to conclude that the thickness of eggs from owls exposed to the chemical is less than owl whos eggs have not been exposed to the chemical.

```
    Welch Two Sample t-test

data:  dt$exposed and dt$not_exposed
t = -1.1623, df = 16.154, p-value = 0.131
alternative hypothesis: true difference in means is less than 0
95 percent confidence interval:
       -Inf 0.09523166
sample estimates:
mean of x mean of y
     3.72      3.91
```

b) Probability of a Type II error

```
[1] 0.0500000000 0.0207474914 0.0074988945 0.0023529776 0.0006392649
```

c) n = 11, so m = 33

```
     One-sample t test power calculation

              n = 10.66853
              d = 0.8207294
      sig.level = 0.05
          power = 0.8
    alternative = greater
```

d) There is not sufficient evidence to suggest that owl eggs from owls exposed to the chemical are less than owl eggs from owls who have not been exposed to the chemeical.

```
    Wilcoxon rank sum test with continuity correction

data:  dt$exposed and dt$not_exposed
W = 40, p-value = 0.2347
alternative hypothesis: true location shift is less than 0
```

e) There is not significant evidence to suggest that the variability of exposed eggs is greater than the variability of unexposed eggs.

```
p-value: 0.8794254
```

f) data collected from the non exposed group does not bass the shapiro test of normality so wilcox will be a better test.

```
shapiro.test(dt$exposed)
```

```
    Shapiro-Wilk normality test

data:  dt$exposed
W = 0.96279, p-value = 0.8171
```

```
shapiro.test(dt$not_exposed)
```

```
    Shapiro-Wilk normality test

data:  dt$not_exposed
W = 0.81803, p-value = 0.02399
```

3) With a significance level of .05, both tests fail to reject the null hypothesis that the vitaminB group is larger than the placebo group. The t-test is more reliable in this case because both samples pass the shapiro test of normality.

```
    Paired t-test

data:  dt$vitaminB and dt$placebo
t = 1.1432, df = 11, p-value = 0.1386
alternative hypothesis: true difference in means is greater than 0
95 percent confidence interval:
 -1.141826       Inf
sample estimates:
mean of the differences
                      2
```

```
    Wilcoxon signed rank test with continuity correction

data:  dt$vitaminB and dt$placebo
V = 47, p-value = 0.1144
alternative hypothesis: true location shift is greater than 0
```

4)

a) $H_o : p_1 = p_2$, $H_1 : p_1 \neq p_2$, where p_1 and p_2 are the probabilities of normal and diabetic patients having low excretions.
b) There is substantial evidience to suggest that the two probabilities are not the same so we reject H_o

```
cat('p-value:', phyper(4, 12, 12, 14))
```

```
p-value: 0.01803742
```

5)

a) $H_o : p_1 = p_2$, $H_1 : p_1 \neq p_2$, where p_1 and p_2 are the probabilities of Drug 1 and Drug 2 successfully anesthetizing membranes.
b) There is sufficient evidence to conclude that the probabilities of the 2 drugs are different.

```
cat('p-value:', phyper(18, 45, 45, 46))
```

```
p-value: 0.02856317
```

6) There is not substantial evidence to conclude that the phenotypes follow the proportion 9:3:3:1.

```
  Oi       Ei        TS
1 926 906.1875 0.4331721
2 293 302.0625 0.2718938
3 288 302.0625 0.6546788
4 104 100.6875 0.1089773

p-value: 0.3104921
```

7)

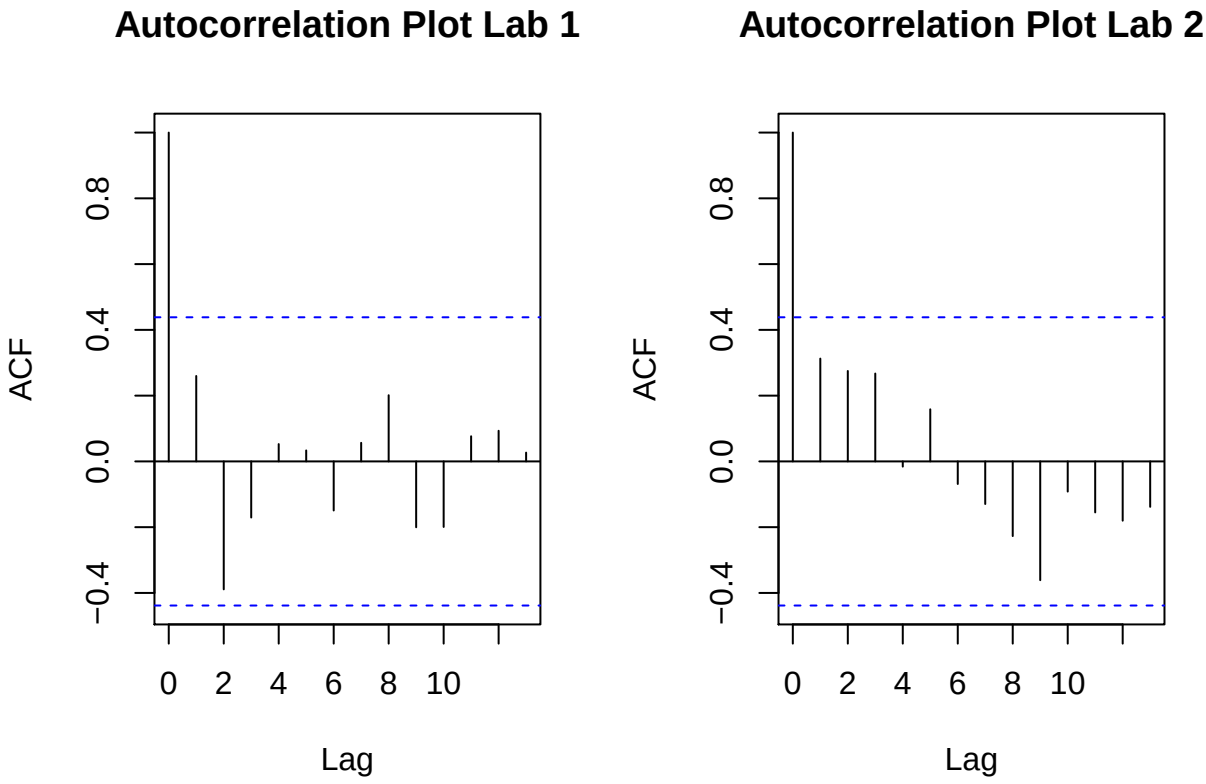
a) Based on the Shapiro Wilks test of normality the data from Lab2 appears normal, while the data from Lab1 does not.

```
    Shapiro-Wilk normality test

data:  dt$Lab.1
W = 0.85222, p-value = 0.005809


    Shapiro-Wilk normality test

data:  dt$Lab.2
W = 0.9357, p-value = 0.1987
```

b) Based on the F test, the two variances appear to be different

```
    F test to compare two variances

data:  dt$Lab.1 and dt$Lab.2
F = 1.8648, num df = 19, denom df = 19, p-value = 0.1835
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.7381127 4.7113394
sample estimates:
ratio of variances
          1.864805
```

c) There is no significant correlation between day to tests, all correlation are within the acceptable "noise" range.



d) Based on wilcox test, the two averages appear to be different. The wilcox test is a better approximation than the t test because one of the labs data appears not to be from a normal distribution.

```
  Wilcoxon rank sum test with continuity correction
```

```
data:  dt$Lab.1 and dt$Lab.2
W = 331.5, p-value = 0.0003827
alternative hypothesis: true location shift is not equal to 0
```

e)

```
Lab.1 95% Confidence Interval: 3.891581 4.172419
```

```
Lab.1 95% Confidence Interval: 3.929172 4.134828
```

8) There is substantial evidence that the relationship between carrier status and size are not independent. Futhermore, measures of assocation show that they have very little association.

```
Oi
```

```
         Carrier NonCarrier
Norm          19        497
Large         29        560
V. Large      24        269
```

```
Ei
```

```
          Carrier NonCarrier
Norm     26.57511   489.4249
Large    30.33476   558.6652
V. Large 15.09013   277.9099
```

```
TS
```

```
            Carrier NonCarrier
Norm     2.15924812 0.11724424
Large    0.05873112 0.00318902
V. Large 5.26077722 0.28565306
```

```
p-value: 0.01940118
```

```
            Association
Phi          0.07510052
Contingency  0.07488962
Cramer's V   0.07507367
```

9)

a) Although the p-value is very close to .05, there is not substantial evidence to conclude that the proportions of white and black death penatly proportions are different.

```
Oi
```

```
      DP No.DP
White 30   184
Black  6   106
```

```
Ei
```

```
           DP    No.DP
White 23.6319 190.3681
Black 12.3681  99.6319
```

```
TS
```

```
            DP     No.DP
White 1.716014 0.2130224
Black 3.278812 0.4070250
```

```
p-value: 0.0603595
```

```
            Association
Phi           0.1312385
Contingency   0.1301227
Cramer's V    0.1310377
```

b) There is not enough evidence to conclude that there is a difference between white and black death sentence proportions.

```
Oi
```

```
      DP No.DP
White 19   141
Black 17   149
```

```
Ei
```

```
            DP    No.DP
White 17.66871 142.3313
Black 18.33129 147.6687
```

```
TS
```

```
              DP      No.DP
White 0.10030888 0.01245214
Black 0.09668326 0.01200206

p-value: 0.8951865

            Association
Phi          0.02606306
Contingency  0.02605421
Cramer's V   0.02602318
```

c) There is not evidence to support that the ratio of dealth penalty sentences for whites and blacks are any different.

```
       White Victim Black Victim
log OR   -0.3850145         -Inf
Weight    0.1630864     1.498052

       OR      Stat        df    pvalue
0.6352968 0.1818143 1.0000000 0.6698187
```

d) All 3 tests were unable to support the evidence that the proportions and ratios between white and black death penalty sentences were any different, although when testing victims race only it was very close to meeting the alpha conditions and with more data it might prove to be significant.