# hw7_lin

## IST 772 Homework 7

### Due November 26, 2021 at 8:00AM EDT

Homework 7 by Nora Lin: I produced the material below with no assistance.

### Excercise 3 p.155:

```
cor.test(rock$area,rock$perm)
```

```
##
##  Pearson's product-moment correlation
##
## data:  rock$area and rock$perm
## t = -2.9305, df = 46, p-value = 0.005254
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.6118206 -0.1267915
## sample estimates:
##       cor
## -0.396637
```

The 95% confidence innterval contains t-value of -2.9305, degrees of freedom 46, and p-value of 0.005254. Assuming that our alpha value is 0.05, we would reject the null hypothesis that the true correlation between area and perm in the rock dataset is equal to zero. The lower bound of the 95% CI is -0.6118 and the upper bound of the 95% cI is -0.1267. We are 95% confident that the true correlationo value is between -0.6118 and -0.1267. The correlatio between area and perm is -0.396. This is moderate but negative correlation. This means that if the area increases, then the perm decreases.

### Exercise 4 p.155:

```
#install.packages("BayesFactor")
library("BayesFactor")
```

```
## Loading required package: coda
```

```
## Loading required package: Matrix
```

```
## ************
## Welcome to BayesFactor 0.9.12-4.2. If you have questions, please contact Richard Morey (richarddmorey
##
## Type BFManual() to open the manual.
## ************
```

```
bfCorTest<- function(x,y){
  zx<- scale(x)
  zy<- scale(y)
  zData<- data.frame(x=zx,rhoNot0=zy)
  bfOut <-generalTestBF(x ~rhoNot0, data=zData)
  mcmcOut <-posterior(bfOut,iterations=10000)
  print(summary(mcmcOut[,"rhoNot0"]))
  return(bfOut)
}
```

```
bfCorTest(rock[,"area"],rock[,"perm"])
```

```
##
## Iterations = 1:10000
## Thinning interval = 1
## Number of chains = 1
## Sample size per chain = 10000
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##           Mean             SD       Naive SE Time-series SE
##      -0.345324       0.136476       0.001365       0.001604
##
## 2. Quantiles for each variable:
##
##     2.5%      25%      50%      75%    97.5%
## -0.61967 -0.43481 -0.34493 -0.25349 -0.07568
```

```
## Bayes factor analysis
## --------------
## [1] rhoNot0 : 8.072781 ±0%
##
## Against denominator:
##   Intercept only
## ---
## Bayes factor type: BFlinearModel, JZS
```

## Exercise 8 p.156:

```
chisq.test(UCBAdmissions[,,1])
```

```
##
##  Pearson's Chi-squared test with Yates' continuity correction
```

```
##
## data:  UCBAdmissions[, , 1]
## X-squared = 16.372, df = 1, p-value = 5.205e-05
```

The reported value of chi-square 16.372 on one degree of freedom has a small p-value of 5.205e-05. Since our p-value is smaller than our assumed alpha level of 0.05. We reject the null hypothesis that there is independence between gender and admission to UCB.

### Exercise 9 p.156:

```
contingencyTableBF(UCBAdmissions[,,1],sampleType="poisson",posterior=FALSE)
```

```
## Bayes factor analysis
## --------------
## [1] Non-indep. (a=1) : 1111.64 ±0%
##
## Against denominator:
##   Null, independence, a = 1
## ---
## Bayes factor type: BFcontingencyTable, poisson
```

The Bayesian factor of 1111.64:1 is in favor of the alternative hypothesis that the two factors are not independent from one another. The Bayes Factor is greater than 3:1, we can say it is positive evidence in favor of non-independence.

### Exercise 10 p.156:

```
MCMCout <- contingencyTableBF(UCBAdmissions[,,1], sampleType="poisson",posterior=TRUE, iterations=10000)
summary(MCMCout)
```

```
##
## Iterations = 1:10000
## Thinning interval = 1
## Number of chains = 1
## Sample size per chain = 10000
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##                Mean     SD Naive SE Time-series SE
## lambda[1,1] 510.56 22.593  0.22593        0.21783
## lambda[2,1] 312.58 17.724  0.17724        0.17724
## lambda[1,2]  89.54  9.496  0.09496        0.09306
## lambda[2,2]  19.86  4.417  0.04417        0.04417
##
## 2. Quantiles for each variable:
##
##                2.5%    25%    50%    75%  97.5%
```

```
## lambda[1,1] 468.13 495.08 510.18 525.63 555.50
## lambda[2,1] 278.80 300.52 312.24 324.40 348.66
## lambda[1,2]  72.12  82.89  89.26  95.70 108.90
## lambda[2,2]  12.07  16.76  19.56  22.62  29.37
```