Sergiu Buciumas STAT7900\_Nonparametrics

Homework 1

* Chapter 1 Exercises: 3, 5, and 6



1. Make a 90% confidence interval for the median

lower<- -1.96\*sqrt(34\*0.5\*0.5)+0.5\*34 = 11.28567~ 11

upper<- 1.96\*sqrt(34\*0.8\*0.2)+0.5\*34+1 = 23.71433 ~ 24

conflevel<-sum(dbinom(11:(24-1),34,0.5))

conflevel = 0.9590404

[25.0: 28.7]

R code function used for calculation test.median and ci.median (used library(asbio))

using test.median function:



using ci.median



b) #20

lower<- -1.645\*sqrt(34\*0.2\*0.8)+0.2\*34

upper<- 1.645\*sqrt(34\*0.8\*0.2)+0.2\*34+1

conflevel<-sum(dbinom(4:(12-1),34,0.2))

0.902554

[20.0: 25.9]

#80

lower<- -1.645\*sqrt(34\*0.2\*0.8)+0.8\*34

upper<- 1.645\*sqrt(34\*0.8\*0.2)+0.8\*34+1

conflevel<-sum(dbinom(23:(31-1),34,0.8))

conflevel = 0.902554

[28.5 : 33.1]

c)

acf(rain, type="correlation")



running that ACF we can see no significant autocorrelation.

I was expecting it with weather data(rain).

**Chapter 1 Ex 5**

1. **Chapter 1 Ex 5**

data<-c(rep(75.1,39),90)

data

mean<-mean(data)

median <- median(data)

summary(data)

sd<-sd(data)

1-pnorm(mean,75,sd/sqrt(40))

test.median(data,75,"greater")



b. Chapter 1 Ex 5 b

t.test(data, alternative="greater", mu=75)



c) Binomial test is able to detect distribution satisfying Ha when we do have skewed distribution and also mean will be influenced by extreme values.

6.

a. If mu = 75, p = 0.5, so power = alpha = 0.05

b. As μ gets large the power will also increase.

c. By increasing the the sample size will result in increasing the power of the binomial test.

**Chapter 2. Ex4.**

1. Test for differences between the two sections using permutation test.

library(perm) ## Load the perm package

section1 <- c(5, 11, 16, 8, 12)

section2 <- c(17, 14, 15, 21, 19, 13)

permTS(section1, section2, method="exact.ce") ### Permutation-based p-value





1. Test for differences using the Wilconxon rank-sum test.

wilcox.test(section1,section2,exact=TRUE,alternative='two.sided') ### Wilcoxon Rank Sum p-value



|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  | Median | Rank sums |
| Section1 | 5 | 11 | 16 | 8 | 12 |  | 11 |  |
| Rank1 | 1 | 3 | 8 | 2 | 4 |  |  | 18 |
| Section2 | 17 | 14 | 15 | 21 | 19 | 13 | 16 |  |
| Rank 2 | 9 | 6 | 7 | 11 | 10 | 5 |  | 48 |

T statistic = 18

**Chapter 2. Ex5.**

speciesA <- c(5.1, 9.4, 7.2, 8.1, 8.8)

speciesB <- c(2.5, 4.2, 6.9, 5.5, 5.3)

wilcox.test(section1,section2,exact=FALSE) ### Wilcoxon Rank Sum p-value

Ho: no difference in means Ha: difference in means

since pvalue >0.05, fail to reject Ho.



**Chapter 2. Ex6**.

Generated dataset:

Treatment1 <- c(91, 87, 99, 77, 88, 91, 85, 79)

Treatment2 <- c(101, 110, 125, 93, 99, 205, 115)

wilcox.test(Treatment1,Treatment2,exact=TRUE,alternative='two.sided')

t.test(Treatment1,Treatment2)





Per our output we do see that Wilcoxon rank sum test is significant(p-value = 0.002576 < 0.05) and Welch Two Sample t-test is not significant (p-value = 0.0584 > 0.05).