lec3_q9

Jiansong Xu

January 24, 2019

```r
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
library(binom)
```

2.

```r
alpha <- 0.05
w2 <- 79
n2 <- 80
pi.hat2 <- w2/n2
pi2.0 = 1
```

a.

```r
print(binom.confint(x = w2, n = n2, conf.level = 1-alpha, methods = "asymptotic"))
```

```
##       method  x  n   mean     lower    upper
## 1 asymptotic 79 80 0.9875 0.9631541 1.011846
```

Wald CI: [0.963 - 1.011]. We except 95% of similarly constructed intervals to contain the true probability of a randomly selected resident to oppose the tax.

b.

```r
print(binom.confint(x = w2, n = n2, conf.level = 1-alpha, methods = "wilson"))
```

```
##   method  x  n   mean     lower   upper
## 1 wilson 79 80 0.9875 0.9325373 0.99779
```

Wilson CI: [0.933 - 0.998]. We expect 95% of similarly constructed intervals to contain the parameter pi which represents the true probability of a randomly selected resident to oppose the tax.

c. We can testify this by performing Score test. H0: pi = 1, Ha: pi < 1

```r
(Z0 = (pi.hat2 - pi2.0)/sqrt(0.5*0.5/n2))
```

```
## [1] -0.2236068
```

```r
(pv.score <- pnorm(Z0)) #lower tail p-value
```

```
## [1] 0.4115316
```

Base on p value we fail to reject H0, so it is possible for pi = 1.

d. I prefer the Wilson CI, as it is constructed using the pi from null hypothesis instead of sample, and the sample size is rather small in this case, so Wilson would perform better.