MATH 3070 Lab Project 12

Aini Liang

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*Remember: I expect to see commentary either in the text, in the code with comments created using `#`, or (preferably) both! **Failing to do so may result in lost points!***

Problem 1 (Verzani problem 8.7)

*Of the last ten times you've dropped your toast, it landed sticky-side down nine times. If these are a random sample from the \(\text{Ber}(p)\) distribution, find an 80% confidence interval for \(p\), the probability of the stidy side landing down. (Use `binconf()` (**Hmisc**) to compute the score interval.)*

```
# Your solution here

library(Hmisc)
```

```
## Loading required package: lattice
```

```
## Loading required package: survival
```

```
## Loading required package: Formula
```

```
## Loading required package: ggplot2
```

```
##
## Attaching package: 'Hmisc'
```

```
## The following objects are masked from 'package:base':
##
##     format.pval, round.POSIXt, trunc.POSIXt, units
```

```
binconf(9, 10, alpha = 0.2, method = "wilson")
```

```
##  PointEst     Lower     Upper
##       0.9 0.7175557 0.9776856
```

Problem 2 (Verzani problem 8.10)

A survey is taken of 250 students, and a \(\hat{p}\) of 0.45 is found. The same survey is repeated with 1000 students, and the same \(\hat{p}\) is found. Compare the two 95% confidence intervals. What is the relationship? Is the margin of error for the second one four times smaller? If not, how much smaller is it? (Use `binom.test()` to answer this problem.)

```
# Your solution here
library(Hmisc)
binom.test(112, 250)
```

```
##
##  Exact binomial test
##
## data:  112 and 250
## number of successes = 112, number of trials = 250, p-value =
## 0.1137
## alternative hypothesis: true probability of success is not equal to 0.5
## 95 percent confidence interval:
##  0.3852992 0.5119484
## sample estimates:
## probability of success
##                  0.448
```

```
binom.test(450, 1000)
```

```
##
##  Exact binomial test
##
## data:  450 and 1000
## number of successes = 450, number of trials = 1000, p-value =
## 0.001731
## alternative hypothesis: true probability of success is not equal to 0.5
## 95 percent confidence interval:
##  0.4188517 0.4814435
## sample estimates:
## probability of success
##                   0.45
```

```
(0.5119484 - 0.3852992)/2
```

```
## [1] 0.0633246
```

```
(0.4814435 - 0.4188517)/2
```

```
## [1] 0.0312959
```

```
# smaller, 1/2
```

Problem 3 (Verzani problem 8.15)

*The `stud.recs` (**UsingR**) data set contains a sample of math SAT scores from some population in the variable `sat.m`. Find a 90% confidence interval for the mean math SAT score for this data. (Do not use `t.test(); find this confidence interval "by hand".)*

```
# Your solution here
library(UsingR)
```

```
## Loading required package: MASS
```

```
## Loading required package: HistData
```

```
##
## Attaching package: 'UsingR'
```

```
## The following object is masked from 'package:survival':
##
##     cancer
```

```
xbar <- mean(stud.recs$sat.m)
sd(stud.recs$sat.m)
```

```
## [1] 69.13024
```

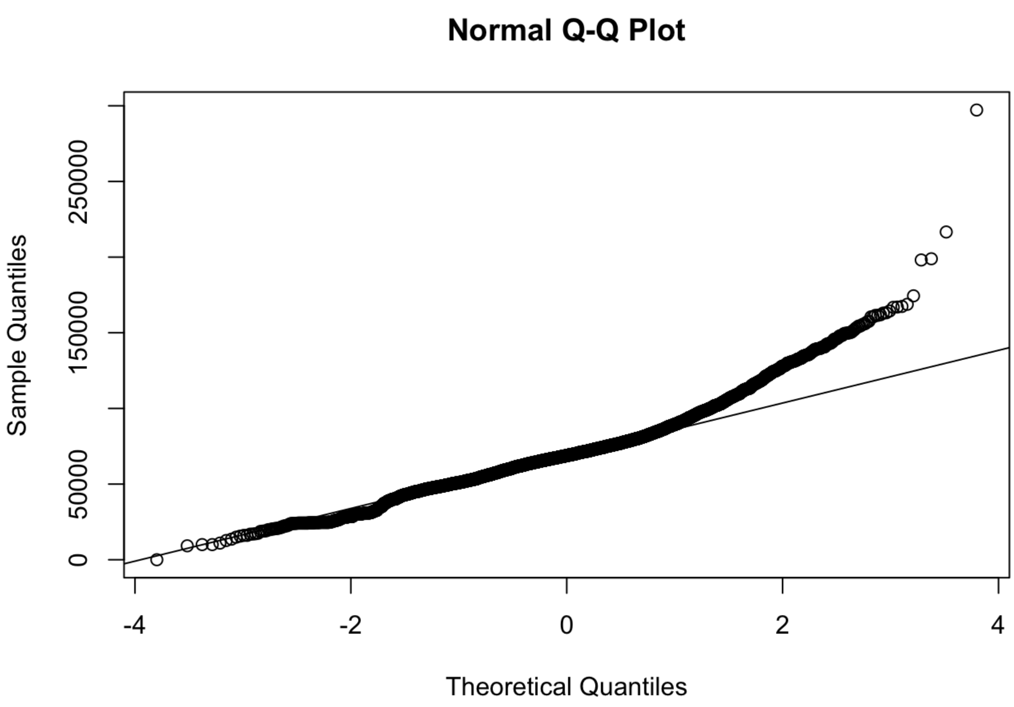
```
tstar <- qt(0.05, length(stud.recs$sat.m) - 1, lower.tail = FALSE)

moe <- tstar * sd(stud.recs$sat.m)/sqrt(length(stud.recs$sat.m))

ci <- c(Lower = xbar - moe, Upper = xbar + moe)
ci
```

```
##    Lower    Upper
## 476.8953 494.9797
```

Problem 4 (Verzani problem 8.15)

*For the `homedata` (**UsingR**) data set find 90% confidence intervals for both variables `y1970` and `y2000`, assuming the sample represents some population. Perform one sample t-test for each variable, use `t.test()`, but first discuss whether the model assumptions are appropriate (include some check of the assumptions, like a Q-Q plot).*

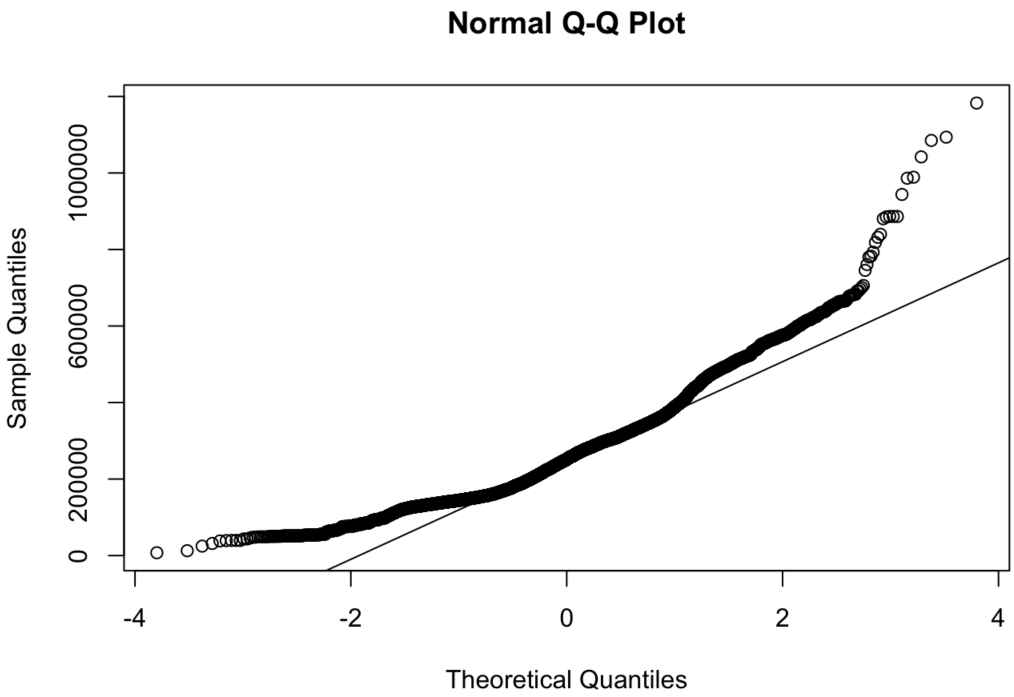
```
# Your solution here
library(UsingR)
# View(homedata)
qqnorm(homedata$y1970)
qqline(homedata$y1970)
```




```
t.test(homedata$y1970, conf.level = 0.9)
```

```
##
##  One Sample t-test
##
## data:  homedata$y1970
## t = 262.87, df = 6840, p-value < 2.2e-16
## alternative hypothesis: true mean is not equal to 0
## 90 percent confidence interval:
##  70377.72 71264.14
## sample estimates:
## mean of x
##  70820.93
```

```
qqnorm(homedata$y2000)
qqline(homedata$y2000)
```




```r
t.test(homedata$y2000, conf.level = 0.9)
```

```
##
##  One Sample t-test
##
## data:  homedata$y2000
## t = 169.79, df = 6840, p-value < 2.2e-16
## alternative hypothesis: true mean is not equal to 0
## 90 percent confidence interval:
##  265769.5 270970.0
## sample estimates:
## mean of x
##  268369.8
```

```r
# data is not appropriate not reliable
```