Computer Project 3

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12/07/2018

MATH 324 Computer Project 3

Exercise 1. Here, we look at how t critical values behave as their df (degrees of freedom) increases:

A) First, what is $z_{.05}$?

```
a <- qnorm(0.05) * (-1)
roundA <- round(a, 5)
paste0("Z(0.05): ", roundA)
```

```
## [1] "Z(0.05): 1.64485"
```

B) Second, if you look at $t_{.05,df}$ (t critical values for $\alpha = .05$) with df = 20, 40, 60, etc (continuing up by 20 each time), for what df does the t critical value first fall strictly within (e.g. $<$)

i. .05 of $z_{.05}$?

```
count1 <- 20
b1 <- qt(0.05, count1) * (- 1)
roundB1 <- round(b1, 5)

while (roundB1 > roundA){
  count1 = count1 + 20
  b1 <- (qt(0.05, count1) * (-1))
  roundB1 <- round(b1, 5)
}
paste0("DF: ", count1)
```

```
## [1] "DF: 1109780"
```

ii. .02 of $z_{.05}$?

```
aii <- qnorm(0.02) * (-1)
roundAii <- round(aii, 5)

count2 <- 20
b2 <- qt(0.02, count2) * (- 1)
roundB2 <- round(b2, 5)

while (roundB2 > roundAii){
  count2 = count2 + 20
  b2 <- (qt(0.02, count2) * (-1))
  roundB2 <- round(b2, 5)
}
paste0("DF: ", count2)
```

```
## [1] "DF: 439960"
```

iii. .01 of $z_{.05}$?

```r
aiii <- qnorm(0.01) * (-1)
roundAiii <- round(aiii, 5)


count3 <- 20
b3 <- qt(0.01, count3) * (- 1)
roundB3 <- round(b3, 5)

while (roundB3 > roundAiii){
  count3 = count3 + 20
  b3 <- (qt(0.01, count3) * (-1))
  roundB3 <- round(b3, 5)
}
paste0("DF: ", count3)
```

```
## [1] "DF: 523320"
```

C) What do you think the difference will be between $z_{.05}$ and $t_{.05,df}$ as df $\to \infty$?

By the data shown in Exercise 1B, it is displayed that as df approaches infinity, the $Z_{0.05}$ and $T_{0.05,df}$ will equal.

Exercise 2) A company with a large fleet of cars want to study the gasoline usage. They check the gasoline usage for 50 company trips chosen at random, finding a mean of 25.02 mpg and sample standard deviation is 4.83 mpg.

A) Which kind of confidence interval is appropriate to use here, z-interval or t-interval?

Null hypothesis: $H_0 : \mu >= 26$

Alternative hypothesis: $H_a : \mu < 26$