STAT 757 – Optional Exercises

Due Thursday, 11 Feb 2016.

The following exercises were given as an optional assignment on Tuesday of Week 4. See the textbook, and see the slides at http://www.pauljhurtado.com/teaching/SP16/Week4A.pdf for additional information and examples.

1. Edit the following code to compare estimates of the slope and intercept obtained from `optimx()` versus `lm()`.

```
library(optimx)
# Simulated data set
set.seed(757)
x=1:20
y=rnorm(length(x),11+1.2*x,sd=pi)

# Minimize obj()=RSS
obj <- function(ps){
  # Fill in the ??? with the appropriate expression:
  # return( sum( (???)^2 ) )
}
p.initial=c(b0=0,b1=0)
opt=optimx(p.initial,obj)
opt

# lm() gives...
summary(lm(y~x))
```

2. The code below illustrates the concept of confidence intervals. Modify the code so that, instead of using `confint()`, upper and lower limits are calculated using `qt()` and the formulas in Ch. 2.

```
x=1:20;  B0=11;  B1=1.2
Nreps=1000
CIdat=data.frame(L0=rep(NA,Nreps),U0=NA,B0.in.CI=NA,L1=NA,U1=NA,B1.in.CI=NA)
for(i in 1:Nreps) {
  y=rnorm(length(x),B0+B1*x,sd=pi)
  M=confint(lm(y~x),level = 0.95)
  CIdat$L0[i] = M[1,1];   CIdat$U0[i] = M[1,2]
  CIdat$L1[i] = M[2,1];   CIdat$U1[i] = M[2,2]
  CIdat$B0.in.CI[i] = ( M[1,1]<B0 & B0<M[1,2] )
  CIdat$B1.in.CI[i] = ( M[2,1]<B1 & B1<M[2,2] )
}
sum(CIdat$B0.in.CI)/Nreps
```

```
## [1] 0.953
```

```
sum(CIdat$B1.in.CI)/Nreps
```

```
## [1] 0.948
```

3. Modify the code resulting from the exercise above to instead (erroneously!) use the Normal distribution instead of the t distribution. That is, assume we can use the mean in place of the expected value, and the sample standard deviation for the population standard deviation. **Does the t or Normal distribution give a broader Confidence Interval?**