Stat 482

Homework Set #2 Solutions

(1.) $t^* = -13.19$, p-value = .000 (test for $H_0: \beta_1 = 0$)
($b_1 = -1.19$, $SE(b_1) = 0.09$)

(2.) Since the data is not compatible with the no effect model, we accept the model which includes age as a predictor for muscle mass.

(3.) ($t^* < 0, b_1 < 0$). The data supports the hypothesis of a negative association between age and muscle mass.

(4.) CI for $\beta_1 = [-1.37, -1.01]$

(5.) An interval estimate for β_1 provides an estimate for the effect size, and a measure of the estimation accuracy.

(6.) CI for $\beta_0^* = [82.85, 87.08]$

(7.) Based on the observed data, we estimate that the mean muscle mass for women at the center value of age ($\bar{X} \approx 60$ yrs) is between 82.85 and 87.08 mmunits

HW #2 Computing

Data from Exercise 1.27

A sample of women is selected to investigate the relationship between age (x) and muscle mass (y)

:

```
hw2.data = read.table(
'http://users.stat.ufl.edu/~rrandles/sta4210/Rclassnotes/data/textdatasets/KutnerData/Chapter%20%201%20Data%20Sets/CH01PR27.txt')
colnames(hw2.data)=c("muscle.mass","age")
attach(hw2.data)

hw2.mod = lm(muscle.mass ~ age)

summary(hw2.mod)
```

```
##
## Call:
## lm(formula = muscle.mass ~ age)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -16.1368  -6.1968  -0.5969   6.7607  23.4731
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 156.3466     5.5123   28.36   <2e-16 ***
## age          -1.1900     0.0902  -13.19   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.173 on 58 degrees of freedom
## Multiple R-squared:  0.7501, Adjusted R-squared:  0.7458
## F-statistic: 174.1 on 1 and 58 DF,  p-value: < 2.2e-16
```

```
confint(hw2.mod)
```

```
##                  2.5 %     97.5 %
## (Intercept) 145.312572 167.380556
## age          -1.370545  -1.009446
```

```r
x.bar = mean(age)
x.bar
```

```
## [1] 59.98333
```

```r
y.bar = mean(muscle.mass)
y.bar
```

```
## [1] 84.96667
```

```r
e = hw2.mod$residuals
n = length(e)
sse = sum(e^2)
mse = sse / (n-2)

lower.star = y.bar - qt(.025,n-2,lower.tail = FALSE)*sqrt(mse/n)
upper.star = y.bar + qt(.025,n-2,lower.tail = FALSE)*sqrt(mse/n)
print(c(lower.star,upper.star),digits=6)
```

```
## [1] 82.8545 87.0788
```