# AMS317 HW5 #2

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2a)

```r
### ??faraway::seatpos
data = data(seatpos, package = "faraway")

fit1 <- lm(hipcenter ~ Ht, data=seatpos)

summary(fit1)
```

```
##
## Call:
## lm(formula = hipcenter ~ Ht, data = seatpos)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -99.956 -27.850   5.656  20.883  72.066
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 556.2553    90.6704   6.135 4.59e-07 ***
## Ht           -4.2650     0.5351  -7.970 1.83e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 36.37 on 36 degrees of freedom
## Multiple R-squared:  0.6383, Adjusted R-squared:  0.6282
## F-statistic: 63.53 on 1 and 36 DF,  p-value: 1.831e-09
```

Yes, it is significant at alpha = 0.01 (Signif. codes: 0 '***')

2b)

```r
fit2 <- lm(hipcenter ~ Weight, data=seatpos)
summary(fit2)
```

```
##
## Call:
## lm(formula = hipcenter ~ Weight, data = seatpos)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
```

```
## -109.446  -23.179   -2.292   20.171  130.567
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   1.2422    34.0563   0.036    0.971
## Weight       -1.0674     0.2134  -5.002 1.49e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 46.45 on 36 degrees of freedom
## Multiple R-squared:   0.41,  Adjusted R-squared:  0.3936
## F-statistic: 25.02 on 1 and 36 DF,  p-value: 1.493e-05
```

Yes, it is significant at alpha = 0.01 (Signif. codes: 0 '***')

2c)

```
fit12 <- lm(hipcenter ~ Ht + Weight, data=seatpos)
summary(fit12)
```

```
##
## Call:
## lm(formula = hipcenter ~ Ht + Weight, data = seatpos)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -99.061 -27.970   4.611  21.910  70.381
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 589.9006   127.4824   4.627 4.92e-05 ***
## Ht           -4.5697     0.9672  -4.725 3.68e-05 ***
## Weight        0.1148     0.3020   0.380    0.706
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 36.81 on 35 degrees of freedom
## Multiple R-squared:  0.6398, Adjusted R-squared:  0.6192
## F-statistic: 31.08 on 2 and 35 DF,  p-value: 1.738e-08
```

It is no longer significant.

2d)

```
cor(seatpos$Ht, seatpos$Weight)
```

```
## [1] 0.8285257
```

Ht is considered to be the "impactful" variable instead since weight and height might be correlated. Height is "credited" as the more impactful variable as a result. Since they are highly correlated, weight does not appear to explain as much of the data.

2e) H_0: beta_Ht = 0 H_1: beta_Ht =/= 0

nested model: Y ~ x_Ht larger model: Y ~ x_Ht + x_Weight

2f) H_0: beta_Ht = 0 and beta_Weight = 0 H_1: at least one of beta_Ht or beta_Weight =/= 0

nested model: Y ~ 1 larger model: Y ~ 1 + x_Ht + x_Weight

2g)

```
anova(fit2,fit12)
```

```
## Analysis of Variance Table
##
## Model 1: hipcenter ~ Weight
## Model 2: hipcenter ~ Ht + Weight
##   Res.Df   RSS Df Sum of Sq      F    Pr(>F)
## 1     36 77664
## 2     35 47420  1     30244 22.322 3.675e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

i) H_0: beta_Ht = 0 H_1: beta_Ht =/= 0
ii) The F statistic for anova(fit2,fit12) is the square of that t test and have the same p value since they have the same nested and larger models.
iii) Even though they are testing the same thing, the anova(fit1,fit2) has models: h_0: Y ~ 1 + beta_weight h_1: Y ~ 1 + beta_weight + beta_Ht

and fit1 had models: h_0: Y ~ 1 h_1: Y ~ 1 + beta_Ht

The models are not the same.