Turkey Weight Example

Data on Blackboard

An experiment is conducted to investigate the relationship between the weight of a turkey (response variable y) and its state of origin(g=Georgia, v=Virginia, w=Wisconsin), with the age of the turkey serving as a covariate (continuous input variable x)

:

```
setwd("F:/Lexar/stat 482 data sets")
turkey.dat = read.csv('turkey.csv')
turkey.dat
```

```
##    origin age weight
## 1       g  28   13.3
## 2       g  20    8.9
## 3       g  32   15.1
## 4       g  22   10.4
## 5       v  29   13.1
## 6       v  27   12.4
## 7       v  28   13.2
## 8       v  26   11.8
## 9       w  21   11.5
## 10      w  27   14.2
## 11      w  29   15.4
## 12      w  23   13.1
## 13      w  25   13.8
```

```
contrasts(turkey.dat$origin) = contr.treatment(3,base = 3)
contrasts(turkey.dat$origin)
```

```
##   1 2
## g 1 0
## v 0 1
## w 0 0
```

```r
interaction.mod = lm(weight ~ age+origin+age*origin,data=turkey.dat)
summary(interaction.mod)
```

```
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.47500    1.26351   1.959   0.0910 .
## age          0.44500    0.05022   8.861 4.72e-05 ***
## origin1     -3.45412    1.53054  -2.257   0.0586 .
## origin2     -2.77500    4.10854  -0.675   0.5211
## age:origin1  0.06104    0.06025   1.013   0.3447
## age:origin2  0.02500    0.15066   0.166   0.8729
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3176 on 7 degrees of freedom
## Multiple R-squared:  0.9821, Adjusted R-squared:  0.9693
## F-statistic: 76.74 on 5 and 7 DF,  p-value: 5.849e-06
```

```r
additive.mod = lm(weight ~ age + origin, data = turkey.dat)
anova(additive.mod,interaction.mod)
```

```
## Analysis of Variance Table
##
## Model 1: weight ~ age + origin
## Model 2: weight ~ age + origin + age * origin
##   Res.Df     RSS Df Sum of Sq      F Pr(>F)
## 1      9 0.81118
## 2      7 0.70618  2     0.105 0.5204 0.6156
```

```r
linear.mod = lm(weight ~ age, data = turkey.dat)
anova(linear.mod,additive.mod)
```

```
## Analysis of Variance Table
##
## Model 1: weight ~ age
## Model 2: weight ~ age + origin
##   Res.Df     RSS Df Sum of Sq     F    Pr(>F)
## 1     11 13.2150
## 2      9  0.8112  2    12.404 68.81 3.517e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

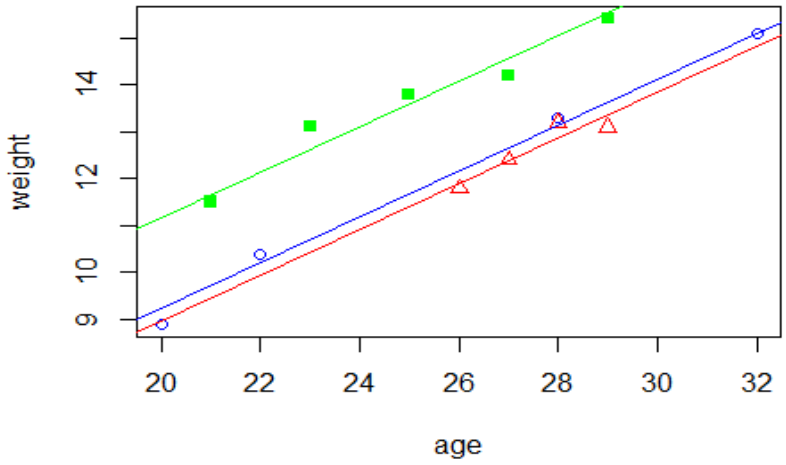
```r
summary(additive.mod)
```

```
##
## Call:
## lm(formula = weight ~ age + origin, data = turkey.dat)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.37353 -0.15294  0.01103  0.17868  0.47353
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.43088    0.65744   2.176   0.0575 .
## age          0.48676    0.02574  18.908 1.49e-08 ***
## origin1     -1.91838    0.20180  -9.506 5.45e-06 ***
## origin2     -2.19191    0.21143 -10.367 2.65e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3002 on 9 degrees of freedom
## Multiple R-squared:  0.9794, Adjusted R-squared:  0.9726
## F-statistic: 142.8 on 3 and 9 DF,  p-value: 6.6e-08
```

```r
b.hat = additive.mod$coefficients

intercept.w = b.hat[1]
intercept.g = b.hat[1]+b.hat[3]
intercept.v = b.hat[1]+b.hat[4]
slope = b.hat[2]


attach(turkey.dat)
plot(age[origin == 'g'], weight[origin == 'g'], xlab='age',
ylab='weight', pch=1, col='blue',xlim = c(min(age),max(age)),ylim =
c(min(weight),max(weight)))
points(age[origin == 'v'], weight[origin == 'v'], pch=2, col='red')
points(age[origin == 'w'], weight[origin == 'w'], pch=15, col='green')
abline(intercept.g,slope,col='blue')
abline(intercept.v,slope,col='red')
abline(intercept.w,slope,col='green')
```




```
dfe = nrow(model.matrix(additive.mod)) - ncol(model.matrix(additive.mod))

V = vcov(additive.mod)

a = c(0,0,1,-1)

b.hat.12 = a %*% b.hat
se.12 = sqrt(a %*% V %*% a)

t.stat.12 = b.hat.12 / se.12
p.value.12 = 2*(1-pt(abs(t.stat.12),dfe))
print(c(t.stat.12,p.value.12))

## [1] 1.2521917 0.2420613

b.hat.12.lower = b.hat.12 - qt(.975,dfe) * se.12
b.hat.12.upper = b.hat.12 + qt(.975,dfe) * se.12

print(c(b.hat.12.lower,b.hat.12.upper))

## [1] -0.2206174  0.7676762

confint(additive.mod)

##                   2.5 %     97.5 %
## (Intercept) -0.05635449  2.9181192
## age          0.42852895  0.5450005
## origin1     -2.37489276 -1.4618719
## origin2     -2.67019011 -1.7136334
```