

STA302 f 2015 Computer Printout

```
> # Pig weight data
> # Function ftest for general linear test. H0: L beta = h, h defaults to zero
> source("http://www.utstat.toronto.edu/~brunner/Rfunctions/ftest.txt")
> # Some critical values for alpha = 0.05
> dfreedom = 68:72
> t_alpha_over_2 = qt(0.975,dfreedom)
> cbind(dfreedom,t_alpha_over_2)
      dfreedom t_alpha_over_2
[1,]        68      1.995469
[2,]        69      1.994945
[3,]        70      1.994437
[4,]        71      1.993943
[5,]        72      1.993464
>
> # Now read the data
> pigs = read.table("http://www.utstat.utoronto.ca/~brunner/data/legal/pigweight.data.txt")
> head(pigs); attach(pigs)
  Drug Momweight Dadweight Pigweight
1    1   133.55   172.97    71.99
2    1   143.65   183.32    76.76
3    1   130.27   186.53    72.22
4    1   128.14   174.55    69.56
5    1   128.21   182.79    73.48
6    1   130.49   182.73    69.85
> n = length(Drug)
> # Make dummy variables
> d1=d2=d3 = numeric(n)
> d1[Drug==1] = 1; d2[Drug==2] = 1; d3[Drug==3] = 1
> fullmodel = lm(Pigweight ~ d1+d3 + Momweight + Dadweight)
> summary(fullmodel)
```

Call:

```
lm(formula = Pigweight ~ d1 + d3 + Momweight + Dadweight)
```

Residuals:

	Min	1Q	Median	3Q	Max
	-3.905	-1.174	0.187	1.351	3.657

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	5.87607	9.19763	0.639	0.52499
d1	1.60557	0.52788	3.042	0.00331 **
d3	0.90077	0.53916	1.671	0.09925 .
Momweight	0.26363	0.04727	5.578	0.000000428 ***
Dadweight	0.17442	0.03465	5.034	0.000003580 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.855 on 70 degrees of freedom

Multiple R-squared: 0.4561, Adjusted R-squared: 0.425

F-statistic: 14.67 on 4 and 70 DF, p-value: 0.00000009393

```

> # Do a few tests
> reduced1 = lm(Pigweight ~ d1+d2 )
> reduced2 = lm(Pigweight ~ Momweight + Dadweight)
> anova(reduced1,fullmodel)
Analysis of Variance Table

Model 1: Pigweight ~ d1 + d2
Model 2: Pigweight ~ d1 + d3 + Momweight + Dadweight
  Res.Df    RSS Df Sum of Sq    F    Pr(>F)
1      72 419.02
2      70 240.81  2    178.21 25.902 0.000000003804 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>
> anova(reduced2,fullmodel)
Analysis of Variance Table

Model 1: Pigweight ~ Momweight + Dadweight
Model 2: Pigweight ~ d1 + d3 + Momweight + Dadweight
  Res.Df    RSS Df Sum of Sq    F    Pr(>F)
1      72 272.70
2      70 240.81  2    31.894 4.6356 0.01286 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>
> L1 = rbind(c(0, 1, 0, 0, 0))
> ftest(fullmodel,L=L1)
      F      df1      df2    p-value
9.251054028 1.000000000 70.000000000 0.003311102
>
> L2 = rbind(c(0, 0, 1, 0, 0))
> ftest(fullmodel,L=L2)
      F      df1      df2    p-value
2.79120433 1.000000000 70.000000000 0.09924863
>
> L3 = rbind(c(0, 1,-1, 0, 0))
> ftest(fullmodel,L=L3)
      F      df1      df2    p-value
1.7770226 1.0000000 70.0000000 0.1868378
>
> L4 = rbind(c(0, 0, 0, 1,-1))
> ftest(fullmodel,L=L4)
      F      df1      df2    p-value
2.5354089 1.0000000 70.0000000 0.1158241
>
> L5 = rbind(c(0,1,0,0,0),
+           c(0,0,1,0,0))
> ftest(fullmodel,L=L5)
      F      df1      df2    p-value
4.63559465 2.000000000 70.000000000 0.01286451
>
> L6 = rbind(c(0,0,0,1,0),
+           c(0,0,0,0,1))
> ftest(fullmodel,L=L6)
      F      df1      df2    p-value
25.902260245782465 2.000000000000000 70.000000000000000 0.000000003803752
>
> L7 = rbind(c(1,0,0,0,0),
+           c(0,1,0,0,0),
+           c(0,0,1,0,0),
+           c(0,0,0,1,0),
+           c(0,0,0,0,1))
> ftest(fullmodel,L=L7)
      F      df1      df2    p-value
22843.9      5.0      70.0      0.0

```