

1. Recall the fat data set from the *faraway* library. The response variable is the percent body fat calculated using Brozek's equation. The following R output is the application of function `anova` to compare models 1 and 2:

```
Model 1: brozek ~ density + weight + adipos + free + chest + thigh + forearm
Model 2: brozek ~ density + age + weight + height + adipos + free + neck +
chest + abdom + hip + thigh + knee + ankle + biceps + forearm +
wrist
      Res.Df    RSS Df Sum of Sq    F Pr(>F)
1         244 199.97
2         235 192.11   9    7.8585 1.0681 0.3872
```

- (a) The numerator of the F statistic is (0.8733).

Justification: The numerator of the F test statistic is

$$\frac{RSS_0 - RSS_\alpha}{DF_0 - DF_\alpha} = \frac{199.97 - 192.11}{244 - 235} = 0.8733.$$

- (b) The denominator of the F statistic is (0.8175).

Justification: The denominator of the F test statistic is

$$\frac{RSS_\alpha}{DF_\alpha} = \frac{192.11}{235} = 0.8175.$$

- (c) According to the p -value we select

(X) Model 1 () Model 2

Justification: The p -value is greater than $\alpha = 5\%$, so we fail to reject the null and select the model under the null which is Model 1.

2. The following output from the `anova` function is available to compare Model 2 and Model 1 fitted to the fat data set from the *faraway* library. Model 2 is obtained from Model 1 by adding the predictors corresponding to the leg circumference measures (thigh, knee and ankle):

```
Model 1: brozek ~ density + age + weight + height + adipos + free + neck +
chest + abdom + hip + I(thigh + knee + ankle) + biceps +
forearm + wrist
Model 2: brozek ~ density + age + weight + height + adipos + free + neck +
chest + abdom + hip + thigh + knee + ankle + biceps + forearm +
wrist
      Res.Df    RSS Df Sum of Sq    F Pr(>F)
1         237 193.54
2         235 192.11   2    1.428 0.8734 0.4189
```

Is the model simplification adequate?

(X) Yes () No

Justification: The p -value is greater than $\alpha = 5\%$, so we fail to reject the null and select the model under the null which is Model 1, which is the reduced model. Hence the simplification is justified.