Math 158 – Linear Models, Spring 2009
Jo Hardin
Confidence Intervals and Testing

parameter	statistic	standard error	multiplier
μ	$\overline{Y}$	$s_y/\sqrt{n}$	$t, df = n-1$
$\mu_1 - \mu_2 = \mu_d$ (paired samp)	$\overline{Y}_1 - \overline{Y}_2 = \overline{Y}_d$	$s_d/\sqrt{n}$	$t, df = n-1$
$\mu_1 - \mu_2$ (ind samp, eq sd, 2 grps)	$\overline{Y}_1 - \overline{Y}_2$	$s_p\sqrt{1/n_1 + 1/n_2}$	$t, df = n_1 + n_2 - 2$
$\mu_i - \mu_j$ (ind samp, eq sd, r grps)	$\overline{Y}_i - \overline{Y}_j$	$s_p\sqrt{1/n_i + 1/n_j}$	$t, df = n_T - r$
$c_1\mu_1 + c_2\mu_2 + \ldots + c_r\mu_r$ (ind samp, eq sd)	$c_1\overline{Y}_1 + c_2\overline{Y}_2 + \ldots + c_r\overline{Y}_r$	$s_p\sqrt{c_1^2/n_1 + c_2^2/n_2 + \ldots + c_r^2/n_r}$	$t, df = n_T - r$
β_0	b_0	$\hat{\sigma}\sqrt{1/n + \overline{X}^2/((n-1)s_x^2)}$	$t, df = n-2$
β_1	b_1	$\hat{\sigma}\sqrt{1/((n-1)s_x^2)}$	$t, df = n-2$
$\hat{\mu}\{Y\|X_o\}$	$\hat{Y} = b_0 + b_1X_0$	$\hat{\sigma}\sqrt{1/n + (X_0 - \overline{X})^2/((n-1)s_x^2)}$	$t, df = n-2$
Pred$\{Y\|X_o\}$	$\hat{Y} = b_0 + b_1X_0$	$\hat{\sigma}\sqrt{1 + 1/n + (X_0 - \overline{X})^2/((n-1)s_x^2)}$	$t, df = n-2$

Notes:

- In the two group case: $s_p^2 = \frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}$
  Which, in the r group case, generalizes to: $s_p^2 = \frac{(n_1-1)s_1^2 + (n_2-1)s_2^2 + \ldots + (n_r-1)s_r^2}{n_T - r}$
- For multiple comparisons (CI **or** testing) in ANOVA with r groups:
  - Use the $t_{n-r}(1-\alpha/2)$ multiplier if you are only doing one planned comparison
  - Use the Tukey method if you are interested in multiple **pairwise** comparisons: $q_{(r,n_T-1)}(1-\alpha)/\sqrt{2}$
  - Use the Scheffe method if you are interested in multiple **linear** comparisons: $\sqrt{(r-1)F_{(r-1,n_T-r)}(1-\alpha)}$
  - Use the Bonferroni adjustment to your α if you are doing more than one test, but they don't fall into the above categories
- For multiple comparisons (CI **or** testing) in regression with p coefficients:
  - Use the $t_{n-p}(1-\alpha/2)$ multiplier if you are only doing one planned comparison
  - For the mean intervals, use the Scheffe procedure to create bands (i.e. bounds for every value of X): $\sqrt{pF_{(p,n-p)}(1-\alpha)}$
  - For the prediction intervals, use the Scheffe procedure to create intervals at g different levels of X: $\sqrt{gF_{(g,n-p)}(1-\alpha)}$
  - Use the Bonferroni adjustment to your α if you are doing more than one test, but they don't fall into the above categories