# 4 Multiple Linear Regression Part 2



4.5 Testing the Significance of an Independent Variable 160

$s_{b_j}$ = the standard error of the j'th model parameter, j = 0, ... k

We will just read $s_{b_j}$ from the Excel SAS or SPSS printout.

We can reject $H_0\colon \beta_j = 0$ in favor of $H_1\colon \beta_j \neq 0$ if |t| = $\left| \frac{b_j}{s_{b_j}} \right| > t_{\alpha/2}^{n-k-1}$

We can reject $H_0\colon \beta_j = 0$ in favor of $H_1\colon \beta_j > 0$ if t = $\frac{b_j}{s_{b_j}} > t_{\alpha}^{n-k-1}$

We can reject $H_0\colon \beta_j = 0$ in favor of $H_1\colon \beta_j < 0$ if t = $\frac{b_j}{s_{b_j}} < t_{\alpha}^{n-k-1}$

Important: We are testing whether the j'th variable has any effect IN THIS MODEL.

A variable may have sharply different effects on the same y

depending on what other variables are in the model!

4.6 Confidence and Prediction Intervals 163

A lower bound for the Margin of Error (not in book)

When all the predictor variables are close to their sample means,

then Distance is close to $\frac{1}{n}$

We can be "almost" $1-\alpha$ confident that $\mu_{y|[x_{1_0}, x_{2_0}, \ldots, x_{k_0}]}$ is within $\left[\hat{y} \pm t_{\alpha/2}^{n-k-1} \frac{s}{\sqrt{n}}\right]$

We can be "almost" $1-\alpha$ confident that

the "next" y whose $x_1 = x_{1_0}, x_2 = x_{2_0}, \ldots, x_k = x_{k_0}$ is within $\left[\hat{y} \pm t_{\alpha/2}^{n-k-1} s\sqrt{1+\frac{1}{n}}\right]$

When all the predictor variables are NOT close to their sample means,

then Distance is MORE THAN $\frac{1}{n}$

Thus to be even "almost" $1-\alpha$ confident

we need wider (vaguer) confidence intervals

which can be found by matrix algebra.

Note for Excel use =TINV($\alpha$,n-k-1) for $t_{\alpha/2}^{n-k-1}$

4.7 The Quadratic Regression Model 167

y is a linear function of two variables one of which is the square of the other

This makes y a nonlinear function of one variable

Mixed quadratic models.