Multiple Regression Analysis. Part II

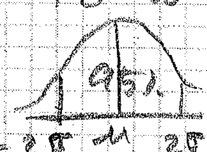
$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon \quad \text{Model}$$

$$\hat{y} = -1.173 + 8.326\, x_1 - .136\, x_2$$ Least squares Prediction equation

$SSE = 130.088$

$$s = \sqrt{\frac{SSE}{n-(k+1)}} = \sqrt{\frac{SSE}{n-3}} = \sqrt{\frac{130.088}{6-3}} = 6.585$$

Interpretation: We expect the model to give predictions of y to within $\pm 2s = 2 \times 6.585$ $= 13.13$



Empirical Rule

the predictions improve as n increases

hat missing

Interpretation of the coefficients

$\hat{\beta}_1 = 8.326$

If we increase x_1 by one unit, KEEPING X2 CONSTANT, the mean value of Y increases by 8.326

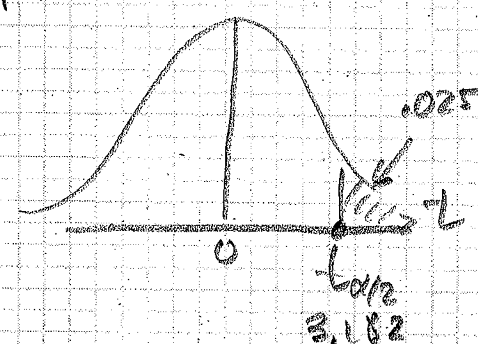
(this interpretation is valid only for first-order models with quantitative variables)

Confidence Intervals for Individual Parameters

$\hat{\beta}_1 = 8.326$

$$\boxed{\hat{\beta}_1 \pm t_{\alpha/2}\, S_{\hat{\beta}_1}}$$

$S_{\hat{\beta}_1} = 6.814$



$95\%\text{ CI} \Rightarrow \alpha = 1 - .95 = .05$

$\Rightarrow \alpha/2 = \frac{.05}{2} = .025$

$df = n-(k+1)$
$= 6-3 = 3$

95% CI for β_1: $8.326 \pm 3.182 * 6.814 =$

$= (-13.36,\ 30.01)$

Hypothesis Tests of Individual Parameters

One-tail test

$H_0: \beta_1 = 0$

$H_a: \beta_1 > 0$ [or $\beta_1 < 0$]

two-tail test

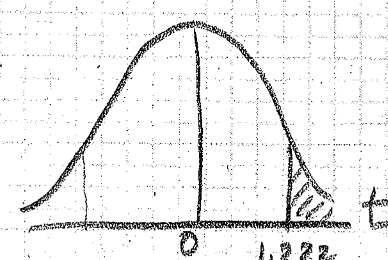
$H_0: \beta_1 = 0$

$H_a: \beta_1 \neq 0$

$$t = \frac{\hat{\beta}_1}{S_{\hat{\beta}_1}} = \frac{8.326}{6.184} = 1.222$$

$\text{pvalue} = \frac{.309}{2} = .1545 > \alpha$

$\alpha = .05$ Fail to reject H_0



Next Video R^2, Adjusted R^2 Test for Significant Overall Regression