**FORMULAE** **SLR**

- $\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x}$ $\qquad S_{xx} = \sum x_i^2 - \frac{\left(\sum x_i\right)^2}{n}$
- $\hat{\beta}_1 = \frac{S_{xy}}{S_{xx}}$ $\qquad S_{yy} = \sum y_i^2 - \frac{\left(\sum y_i\right)^2}{n}$
- $s^2 = \frac{SSE}{n-2}$ $\qquad SSE = S_{yy} - \frac{\left(S_{xy}\right)^2}{S_{xx}}$ $\qquad S_{xy} = \sum x_i y_i - \frac{\left(\sum x_i\right)\left(\sum y_i\right)}{n}$
- $t = \frac{\hat{\beta}_1}{s/\sqrt{S_{xx}}} \sim t_{(n-2)}$
- $100(1-\alpha)\%$ C.I. for $\beta_1$ : $\left(\hat{\beta}_1 \pm t_{\alpha/2;n-2} \cdot s/\sqrt{S_{xx}}\right)$
- $TSS = S_{yy}$ $\qquad SSR = \frac{\left(S_{xy}\right)^2}{S_{xx}}$ $\qquad F = \frac{MSR}{MSE} \sim F_{(1,n-2)}$
- $100(1-\alpha)\%$ C.I. for $E\left(y \mid x_p\right)$: $\left(\hat{y} \pm t_{\alpha/2;n-2} \cdot \sqrt{MSE\left(\frac{1}{n} + \frac{\left(x_p - \bar{x}\right)^2}{S_{xx}}\right)}\right)$
- $100(1-\alpha)\%$ P.I. for individual $y \mid x_p$ : $\left(\hat{y} \pm t_{\alpha/2;n-2} \cdot \sqrt{MSE\left(1+\frac{1}{n} + \frac{\left(x_p - \bar{x}\right)^2}{S_{xx}}\right)}\right)$
- coefficient of correlation between $x$ & $y$: $\quad r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}}$
- coefficient of determination: $\quad r^2 = \frac{SSR}{TSS}$
- lack of fit: $SSE = SSPE + SSLF$ , $\qquad SSPE = \sum_i \sum_j \left(y_{ij} - \bar{y}_i\right)^2$

$$F_{LF} = \frac{MSSLF}{MSSPE} = \frac{SSLF/\left[n-2-\sum\left(n_i-1\right)\right]}{SSPE/\left[\sum\left(n_i-1\right)\right]} \sim F_{\left(n-2-\sum\left(n_i-1\right),\sum\left(n_i-1\right)\right)}$$