

$$\text{var}(\hat{\beta}_1) = \frac{\sigma^2}{\text{variation in } x} = \frac{\sigma^2}{SST_x} = \frac{\sigma^2}{\sum_i (x_i - \bar{x})^2}$$

$$\text{sd}(\hat{\beta}_1) = \frac{\sigma}{\sqrt{SST_x}}$$

$\sigma \rightarrow \text{unknown}$

$$\text{unbiased estimator of } \sigma^2 : \hat{\sigma}^2 = \frac{SSR}{(n-2)} = \frac{\sum_i \hat{u}_i^2}{(n-2)}$$

$\hat{\sigma}$: std. error of regression

$$\text{std. error of } \hat{\beta}_1 : \text{se}(\hat{\beta}_1) = \frac{\hat{\sigma}}{\sqrt{SST_x}}$$