

More About Standard Errors

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Under the relatively stricter assumptions of constant error variance, the variance of a slope coefficient is given by

$$V(\hat{\beta}_j) = \frac{\sigma^2}{SST_j(1 - R_j^2)}$$

A similar formulation is given in *FOAS* as definition 4.2.3,

$$\hat{V}_C[\hat{\beta}] = \hat{\sigma}^2 (X^T X)^{-1} \rightsquigarrow \frac{\hat{\sigma}^2}{(X^T X)}$$

Explain why each term makes the variance higher or lower:

- σ^2 is the variance of the error ϵ
- SST_j is (unscaled) variance of X_j
- R_j^2 is R^2 for a regression of X_j on the other X 's