Sources of Variation

(1) ∃ Variation between group means
Attibuted to treatment(s) (Treatment variation)
(Factor of interest)

Regression: $\Sigma(\hat{y}-\overline{y})^2$

Anova: $\Sigma n_i(\overline{x}_i-\overline{x})^2;\ df=(k-1)$

SSB=SST-SSE

SS_B (Between)
SS_T (Treatment)
SS_{model}
TSS (tmt SS)

(2) ∃ Variation within any group
"Within group" variation
Unexplained random error
("Residual" variance, or "error" variance)

Regression: $\Sigma(y-\hat{y})^2$

Anova: $\Sigma(x_i-\overline{x}_i)^2;\ df=(N-1)-(k-1)=N-k$

SS_W (within)
SS_{err} (error)
SS_{resid}
RSS (residual SS)

(3) Total variation
Lump all observations together, ignoring factors of interest.
Deviation from the grand mean

$\Sigma(x_i-\overline{x})^2;\ df=(N-1)$
$df\cdot\mathrm{var}(x_i)$

Or calculate from SST=SSB+SSW, or SST=SS_{tmt} + SS_{error}

SS_{TOT} (total)

Under H_0, $MS_{tmt} \approx MS_{err}$ (MSB == MSW) and both estima σ_e^2
If H_0 false, $MS_{tmt} > MS_{err}$.

The "residual standard error" is the "root MSE" (i.e., square root of the mean square error)

R^2 is the variation explained by the model = SS_{tmt}/SS_{err}.