Multiple Regression – Hypothesis Testing

- Test the Intercept Coefficient (two-sided t-Test)

Is the Intercept significantly different from 0?

- Test each Slope Coefficient (two-sided t-Test)

Are the independent variables significant?

- Test the set of independent variables (F-Test)

Is the overall model significant?

Multiple Regression – F-Test

F-Test

- Assesses how well the set of independent variables, as a group, explains the dependent variable.
- Tests whether at least one of the independent variables explains the dependent variable with statistical significance.

$$H_0: b_1 = b_2 = b_3 = \cdots = b_k = 0$$
$$H_a: at\ least\ one\ b \neq 0$$

- Model as a whole can be highly significant (F-Test), even if none of the independent variables is significant (t-Tests) → Multicollinearity

F-Test – how it works

F-Test

- Always a one-sided test
- F-Statistic (ANOVA / statsmodels)

$$F = \frac{explained\ variation\ (RSS)/k}{Mean\ Squared\ Error\ (MSE)}$$

k = number of independent variables

- p-value of the Test with statsmodels
- Compare p-value with level of significance
- Rule of Thumb: Reject H_0 in case F-Statistic is high / p-value is low (< 1%)

  → Model as a whole is significant