More Hypothesis Testing: F Tests

Testing The Whole Equation or a Collection of Coefficients

Another Hypothesis & Test: the F Test

• Does Entire Equation Matter? \( Y = f(\text{time}) \)
  – (All Variables Taken Together)
    • For Simple Regression, Not Much New
    • Only a Single Driver
    • Not Really Different From t Test for Driver
  – For Multiple Regression \( Y = f(X,Z) \)
    • Multiple Drivers Exist
    • Combined Effect vs Individual Effects
    • A Test of JOINT Significance
    • \( B_1 = B_2 = 0 \)

F Test & Statistic

• Related to R Square
  – R-square Gives Percent Explained, but Doesn’t Indicate Statistical Significance
  – \( R^{\text{square}} = \frac{\text{Explained SSE}}{\text{Total SSE}} \)
  – F test Gives Statistical Significance
  – Doesn’t Give the % Explained
• F Test is a Test of Significance for R-square

\[
F = \frac{\text{(Explained)} - \text{(Unexplained)}}{\text{RSS}(K-1)} \bigg/ \frac{\text{ESS}(N-K)}{
\]
The F Test:

- Is Just Another Hypothesis Test:
  - General Procedure Same, Different Distribution
  - Calculate the F Value
  - Two Sets of Degrees of Freedom \((K-1)\) & \((N-K)\)
  - Critical Value Comes from “F Table”
  - Test is Automatically 1 Tail

\[
F = \frac{(RSS)/(K-1)}{(ESS)/(N-K)}
\]

The Actual Mechanics of F Testing: EViews

\[Q = 134063-3083\times P1-449\times \text{Adv}-88\times \text{Spring}+2223\times \text{Summer}-422\times \text{Fall}+537\times \text{Qtr}\]

\[N = 22, k = 7\]

Critical value = 2.39 \((k-1), (N-k)\)

Conclusion: All coefficients on all driver variables not simultaneously equal zero.

At least some coefficients are statistically significantly different from zero.

At least some drivers collectively matter.

The equation as a whole has a statistically significant amount of explanatory power.
An Extension of the F Test

• Remember the Entire Equation Test:
  – Given: \( Y_t = B_0 + B_1 X_t + B_2 Z_t + B_3 W_t \)
  – Test is: \( B_1 = B_2 = B_3 = 0 \)

• Why Not Consider a Subset:
  – Test: \( B_2 = B_3 = 0 \)
  – More than the Individual t Tests
  – Less than the Overall F Test
  – Mechanics About the Same
  – Mechanized in Eviews

Extended F Testing in Eviews

Wrap Up:

• More Hypothesis Testing: The F Test
• Testing Significance of Overall Equation
  – All Coefficients Simultaneously Equal Zero
  – Linked to R Square
  – Mechanics:
    • Stat Tables & Prob Value Approach
    • Eviews Output & Procedures
• F Tests on Subsets of Coefficients
  – Variation on a Theme
  – Eviews Procedures & Interpretation