Adding variables.

- There is a difference between assessing the statistical significance of a variable acting alone and a variable being added to a model.

Summary

- Test 1 by itself is statistically significant.
  - $t=2.97$, $P$-value=0.0074
- Test 2 by itself is not statistically significant.
  - $t=2.05$, $P$-value=0.0530

Summary

- Test 1 adds significantly to the model that already contains Test 2.
  - $t=2.52$, $P$-value=0.0205
- Test 2 does not add significantly to the model that already contains Test 1.
  - $t=1.51$, $P$-value=0.1469
Adding another variable

- Model with Test 1, Test 2, and Test 3.
- Can think about this as adding Test 3 to the model that already has Test 1 and Test 2 in it.
Change in $R^2$

- Model with Test 1, Test 2, and Test 3 – $R^2=0.526$
- Model with Test 1 and Test 2 – $R^2=0.367$
- Difference = $0.526 - 0.367 = 0.159$

Statistical Significance

- Is the change in $R^2$ statistically significant?
- Parameter Estimate for Test 3.
  - $t=-2.52$, $P$-value = 0.0209
- Effect Test for Test 3.
  - $F=6.343$, $P$-value = 0.0209

- Because the $P$-value (0.0209) is small (< 0.05) we would reject the null hypothesis that the slope parameter is zero.
- Test 3 adds significantly to the model with Test 1 and Test 2.
Other Tests

- Does Test 1 add significantly to the model with Test 2 and Test 3?
  - $t=3.52$, $P$-value=$0.0023$
  - $F=12.424$, $P$-value=$0.0023$

Statistical Significance

- Because the $P$-value (0.0023) is so small (< 0.05) we would reject the null hypothesis that the slope parameter is zero.
- Test 1 adds significantly to the model with Test 2 and Test 3.

Other Tests

- Does Test 2 add significantly to the model with Test 1 and Test 3?
  - $t=1.36$, $P$-value=$0.1909$
  - $F=1.840$, $P$-value=$0.1909$
Statistical Significance

- Because the P-value (0.1909) is not small (> 0.05) we would fail to reject the null hypothesis that the slope parameter is zero.
- Test 2 does not add significantly to the model with Test 1 and Test 3.

Unanswered Questions

- Is Test 3, by itself, statistically significant?
- Does Test 3 add significantly to the model with Test 1?
- Does Test 3 add significantly to the model with Test 2?

Test 1, Test 2 and Test 3

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Stat 301 – Lecture 15

Test 1 and Test 2

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Test 1 and Test 3

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