

Chapter 1: Simple (Bivariate) Regression

Confidence Intervals

A student, Matthew Brenneman, pointed out a more accurate description of a confidence interval than mine. In the text (p. 13) I said:

The 95% confidence interval is also shown in Figure 1.7 (.809 to 3.171) and may be interpreted as “there is a 95% chance that the true (but unknown) regression coefficient is somewhere within the range .809 to 3.171” or, perhaps more accurately, “if we were to conduct this study 100 times, 95 times out of 100 the b would be within the range .809 to 3.171.”

It would be nice if we could make these interpretations, but neither of these are really accurate. Here’s a more accurate description, from Matthew:

If we computed 100 CIs (using 100 independent samples of the same size), we would expect this value of b to be in 95% of them.

Or, alternatively:

If we were to conduct this study and compute CIs 100 times, the value 1.99 should be in 95 of those CIs.

In thinking about this I came across several good sources for additional study. Thompson’s text has a nice explanation (Thompson, 2006).

Geoff Cumming is a great source of clear writing about confidence intervals and their uses and advantages. Here’s a nice interpretation:

“...if the experiment were repeated many times and a CI calculated for each, in the long run 95% of the intervals would include μ ” (or, in our case, b) (Cumming & Finch, 2005, p. 174).

A good web page is http://inspire.stat.ucla.edu/unit_10/teaching_tips.php . Here’s a creative explanation of confidence intervals from that source:

“One way to explain confidence intervals that might stick in students' heads is this. A dog is tied to a tree, and this dog's leash is three standard errors long. The dog likes the shade of the tree, and 68% of the time you'll find the dog within one standard error of the tree. 95% of the time the dog will be two standard errors from the tree and on rare occasions, maybe when a cat comes by, the dog is 3 standard errors away. Now for some reason, the tree has become invisible and all you see is the dog. Where would you say the tree is? You'd be 95% confident it was within 2 standard errors of the dog, wouldn't you?”

References

- Cumming, G., & Finch, S. (2005). Inference by eye: Confidence intervals and how to read pictures of data. *American Psychologist, 60*, 170-180. doi: 10.1037/0003-066X.60.2.170
- Thompson, B. (2006). *Foundations of behavioral statistics*. New York: Guilford.