

Day #18 Exercise – SOLUTIONS

You have simulated two systems for 7 replications each. The sample means for response times from system #1 are 110, 105, 110, 108, 102, 112, and 98 milliseconds, and from system #2 they are 110, 90, 100, 80, 85, 85, and 105 milliseconds. Can you, with 95% confidence, state that system #2 has lower response time than system #1? Why or why not? Show your work. A T-score table is given below.

First we determine the difference between sample means (for system #1 minus system #2):

0 milliseconds
15
10
28
17
27
-7

It certainly looks like system #2 is better (i.e., has lower true mean response time).

$$\bar{Y} = \frac{1}{7} \cdot (0 + 15 + 10 + 28 + 17 + 27 + (-10)) = 12.857$$

$$S = \sqrt{\frac{1}{7-1} \cdot [(0-12.857)^2 + (15-12.857)^2 + \dots + ((-7)-12.857)^2]} = 13.031$$

$t_{\alpha/2} = 2.45$ (for 95% confidence we use $\alpha = 0.05$ and $N = 7$ degrees of freedom, so we use the $N - 1 = 6$ row)

$$H = 2.45 \cdot \left(\frac{13.013}{\sqrt{7}} \right) = 12.065$$

So, we can say with 95% confidence that the population mean (true mean) lies between 0.792 and 24.922 (that is, 12.857 ± 12.065). Since this CI is entirely above zero, we can say with 95% confidence that system #2 is better (better = lower response time in this case) than system #1.

Selected values of $t_{\alpha/2; N-1}$

	$\alpha/2 = 0.05$	$\alpha/2 = 0.025$
N - 1	t	t
4	2.13	2.78
5	2.02	2.57
6	1.94	2.45
7	1.90	2.37
8	1.86	2.31
9	1.83	2.26
10	1.81	2.23
11	1.80	2.20
12	1.78	2.18