Section 2: Testing for correlation

Exercise level 2 solutions

1. $H_0: \rho = 0$
   $H_1: \rho > 0$
   So 1-tail test.
   From tables, for 5% significance level and $n = 18$, critical value = 0.4000
   Acceptance region: $r \leq 0.4000$
   Test correlation coefficient, $r = 0.42 > c.v.$
   So significant result. Reject H_0
   There is sufficient evidence to suggest there is a positive correlation between values x and y in the parent population.

   (Context is so important here, if you had wanted to test for any correlation at 5%, the 2-tail test is stronger, as only rejects H_0 at 2.5% at either end and H_0 would be accepted)

2. $H_0: \rho = 0$
   $H_1: \rho \neq 0$
   So 2-tail test.
   From tables, for 1% significance level and $n = 15$, critical value = 0.6411
   Critical region: $r < -0.6411$, $r > 0.6411$
   Test correlation coefficient, $r = -0.6$
   $0.6 < 0.6411$ (or $-0.6 > -0.6411$)
   So the result is not significant. Accept H_0.
   There is insufficient evidence to suggest there is any correlation between x and y.

3. A 1-tail p-value of 0.0171 means there is 1.71% chance of obtaining any sample size 50 with such an extreme negative value or worse from a population with no correlation.

   The 2-tail p-value is $2 \times 0.0171 = 0.0342$. So there is 3.42% chance of obtaining such an extreme value (positive or negative) from a population with no correlation.

   H_0 $\rho = 0$
   H_1 $\rho \leq 0$
   1-tail test
   p-value is 1.71%
   $1.71\% < 5\%$.
   So the result is significant. Reject H_0.
   There is sufficient evidence to suggest there is a negative correlation between x and y.

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4. $H_0: \rho = 0$

   $H_1: \rho > 0$

   So 1-tail test.

   From tables, for 1% significance level and $n = 25$, critical value = 0.4622

   Test correlation coefficient, $r = 0.48 > c.v.$

   So significant result. Reject H_0

   There is sufficient evidence to suggest there is a positive linear correlation between x and y.