Chapter 18: More about Tests, p522

- null hypothesis has to *give a parameter value* like $H_0: p = 0.7$.
- alternative has to say *what you are trying to prove* like $H_A: p \neq 0.7$.
- Kind of alternative you use depends on exactly what you want to prove:
  - is p different? (2-sided)
  - is p larger? (1-sided)
  - is p smaller? (1-sided)

- Failing to reject H_0 does not prove that H_0 correct.
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Tests and Confidence interval for the population mean Chap 20 p555

Similar idea as for proportions:

Ex:

In a metropolitan area, the concentration of cadmium (Cd) in leaf lettuce was measured in 6 representative gardens where sewage sludge was used as fertilizer. The following measurements (in mg/kg of dry weight) were obtained.

Cd

21 38 12 15 14 8

Is there strong evidence that the mean concentration of Cd is higher than 12.

Descriptive Statistics

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cd	6	18.00	14.50	18.00	10.68	4.36

$$H_0: \mu = 12$$

$$H_a: \mu > 12$$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{18 - 12}{10.68/\sqrt{6}} = 1.38$$

degrees of freedom = 6 – 1 = 5

t = 1.38

p-value > 0.10.

Do not reject H_0 at $\alpha = 0.05$.

CIs for the population mean μ

Give a 95% CI for the mean Cd concentration.

$$\left(\bar{x}-t\frac{s}{\sqrt{n}},\bar{x}+t\frac{s}{\sqrt{n}}\right)=\left(18-2.571\times\frac{10.68}{\sqrt{6}},18+2.571\times\frac{10.68}{\sqrt{6}}\right)$$

- StatCrunch commands

Stat > T Statistics > One-Sample

Hypothesis test results:

μ : mean of Variable

H_0 : μ = 12

H_A : μ > 12

Variable	Sample Mean	Std. Err.	DF	T-Stat	P-value
Cd	18	4.358899	5	1.3764944	0.1136

95% confidence interval results:

μ : mean of Variable

Variable	Sample Mean	Std. Err.	DF	L. Limit	U. Limit
Cd	18	4.358899	5	6.795094	29.204906

Exercise.

In order to test $H_0:\mu=60 \quad vs \quad H_a:\mu\neq 60$ a random sample of 9 observations (normally distributed) is obtained, yielding $\bar{x}=55$ and s = 5. What is the p-value of the test for this sample?

a) greater than 0.10
b) between 0.05 and 0.10
c) between 0.025 and 0.05
d) between 0.01 and 0.025
e) less than 0.01

Ans: t = -3 p is between 0.005x2 and 0.01x2 i.e. between 0.01 and 0.02 and so d) the answer.

We are done!

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