Section 7.10: One sample Test Concerning Variances

Friday, March 29, 2019 3:57 PM

(note: we will not do two-sample tests)

so far, we've done tests on μ, p

now let's test σ given s

---

example: How precise is your measuring instrument? For digital scales, the manufacturer may claim that the scale reads to within $\pm$ 0.1 g. How can you verify this?

---

test statistic:

n = sample size

variance from sample

$$\chi^2 = \frac{(n-1)s^2}{\sigma_0^2}$$

claim of what the population variance should be

under the condition that the population is normally distributed

example: In any canning factory, the manufacturer loses money if cans are overfilled and risks fines if they are underfilled. Therefore, a quality control inspector at the Gunk Factory is interested in testing whether the amount of gunk dispensed into their 32-ounce cans has a variance of greater than 0.2 oz^2.

Due to practical constraints, a random sample of 10 cans will have to do. Their weights have:

$$\bar{x} = 31.55 \text{ ounces}$$
$$s = 0.48 \text{ ounces}$$

Do the dispensing machines need adjusting? Test with 95% confidence. You may assume the the amounts dispensed are normally distributed.

a) state the conditions under which you are performing this test

pop normal

σ unknown, but s is known

b) state the null and alternate hypotheses

H_0: $\sigma^2 = 0.2 \; oz^2$ (no adjustment needed)

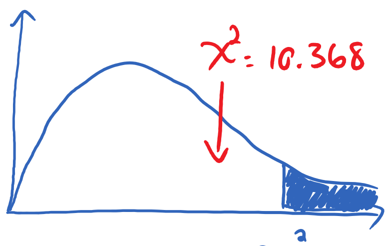
H_a: $\sigma^2 > 0.2\ oz^2$ (one-tailed)

c) Calculate the test statistic

$$\chi^2 = \frac{(n-1)s^2}{\sigma_0^2}$$

$$= \frac{9(0.48)^2}{0.2}$$

$$= 10.368$$



$\chi^2_{0.05} = 16.919$

$1-\alpha = 0.95$

$df = 9$

$\therefore$ in acceptance region

conclusion: At the 95% level, we can conclude that the machines do not need adjusting.

more careful language: At the 95% confidence level, there is not significant evidence to suggest that the machines need adjusting.