Section 8-4

Testing a Claim about a Standard Deviation or Variance

ASSUMPTIONS FOR TESTING A CLAIM ABOUT $\sigma$ OR $\sigma^2$

1. The sample is a simple random sample.
2. The population has values that are normally distributed. This is a strict requirement.

CHI-SQUARE DISTRIBUTION

Test Statistic: $\chi^2 = \frac{(n - 1)s^2}{\sigma^2}$

$n = \text{sample size}$
$s^2 = \text{sample variance}$
$\sigma^2 = \text{population variance}$
P-VALUES AND CRITICAL VALUES FOR CHI-SQUARE DISTRIBUTION

- Use Table A-4.
- The degrees of freedom \((df) = n - 1\)

PROPERTIES OF CHI-SQUARE DISTRIBUTION

1. All values of \(\chi^2\) are nonnegative, and the distribution is not symmetric.
2. There is a different distribution for each number of degrees of freedom.
3. The critical values are found in Table A-4 using \(n-1\) degrees of freedom.

CRITICAL VALUES

Suppose the significance level is \(\alpha = 0.05\).

Right-tailed test:
Because the area to the right of the critical value is 0.05, locate 0.05 at the top of Table A-4.

Left-tailed test:
With a left tailed area of 0.05, the area to the right of the critical value is 0.95, so locate 0.95 at the top of Table A-4.

Two-tailed test:
Divide the significance level of 0.05 between the left and right tails, so that the areas to the right of the two critical values are 0.975 and 0.025, respectively. Locate 0.975 and 0.025 at the top of Table A-4.