Chapter 8

Lecture 4

Section: 8.6

Recall that when we talk about *Variance* and *Standard Deviation,* we are talking about an *error*. This tells us that a manufacturer or a service provider will improve quality by reducing variation. Quality-control engineers want to ensure that a product has an acceptable mean, but they also want to produce items of *consistent* quality so that there will be few defects. Which leads us to Hypothesis Testing about a Variance or Standard Deviation.

<u>Properties of the Chi-Square Distribution</u>

1. All values of χ^2 are nonnegative, and the distribution is not symmetric.

2. There is a different χ^2 distribution for each number of degrees of freedom.

3. The critical values are found in Table A-4 using

degrees of freedom = $n - 1$

Testing Claims About a Variance or Standard Deviation

Assumptions

1. The sample is a simple random sample.

2. The population must have a normal distribution.

-This is a strict requirement-

Test Statistic for Testing a Claim About a Variance or Standard Deviation:

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

1. In order to test H_0: $\sigma = 50$ vs. H_a: $\sigma > 50$. A simple random sample of size $n = 31$ is obtained from a population that is known to be normally distributed. If the sample standard deviation is determined to be $s = 47.2$, test the claim that $\sigma > 50$ at the $\alpha = 0.05$ level of significance.

2. Adult IQ scores are normally distributed with a mean of 100 and a standard deviation of 10. A simple random sample of 24 PhD professors yields an average of 128 and standard deviation of $s = 7$. A psychologist is quite sure that PhD professors have IQ scores that have a mean greater than 100. However, she claims that the IQ scores of PhD professors are closer to the mean than that of the general population. Assume that IQ scores of PhD professors are normally distributed and test the claim at a 0.05 significance level.