Sampling Distribution of the Variance (The Chi-Square Distribution)

Introduction

- Although inferences concerning a population variance or standard deviation are usually of less interest than those about a mean or proportion, there are occasions when such procedures are needed.
- In the case of a normal population, distribution inferences are based on results concerning the sample variance s^2 .

Since s^2 cannot be negative we should suspect that this sampling distribution is not a normal curve. It is called the chi-square distribution.

Theorem: If s^2 is the variance of a random sample of size *n* taken from a normal population having the variance , σ^2 then

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

is the value of a random variable, having the chi-square distribution with the parameter $\nu = n-1$.

Example 5.3

It is claimed that the variance of a normal population σ^2=21.3 is rejected if the variance of a random of a random sample of size 15 exceeds 39.74. What is the probability that the claim will be rejected even though σ^2 = 21.3?