

The Sampling Distribution of Variances (The F Distribution)

Introduction

- A problem closely related to that of finding the distribution of the sample variance is that of finding the distribution of the ratio of the variances of two independent random samples .
- This problem is important because it arises in tests in which we want to determine whether two samples come from populations having equal variances.

Theorem: If s_1^2 and s_2^2 are the variances of independent random samples of size , n_1 and n_2 respectively taken from two normal populations having the same variance, then $F = \frac{s_1^2}{s_2^2}$

is a value of a random variable having the F distribution with the parameters

$$v_1 = n_1 - 1 \text{ and } v_2 = n_2 - 1$$

Example 5.4

If two independent random samples of size $n_1 = 7$ and $n_2 = 3$ are taken from a normal population, what is the probability that the variance of the first sample will be at least three times as large as that of the second sample?