

WWS 508b

Precept 2

John Palmer

February 23, 2010

Find the Whiting in this picture...



Comparing Variances

$$F = \frac{s_1^2}{s_2^2}$$

Assuming s_1^2 and s_2^2 are sample variances from independent random samples drawn from normal populations, then this statistic has an F distribution with $n_1 - 1$ and $n_2 - 1$ degrees of freedom when $H_0 : \sigma_1 = \sigma_2$ is true.

Comparing Means

Normal Populations

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Comparing Means

Non-Normal Populations with different variance

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Note that this statistic does *not* have a t -distribution. As an approximation, we can treat it as a t distribution with k degrees of freedom, where k is either calculated using statistical software or estimated conservatively as:

$$k = \min\{n_1 - 1, n_2 - 1\}$$

Comparing Means

Non-Normal Populations with equal variance: pooled estimator

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}}$$

where

$$s_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$$

This statistic has a t -distribution with k degrees of freedom calculated as:

$$k = n_1 + n_2 - 2$$

Generating Random Numbers

What is a random number?

Generating Random Numbers

What is a random number?

How would you go about generating one?

Generating Random Numbers

What is a random number?

How would you go about generating one?

How can a random number be generated by a deterministic process?

Generating Random Numbers

What is a random number?

How would you go about generating one?

How can a random number be generated by a deterministic process?

How to do it with Excel?

Generating Random Numbers

What is a random number?

How would you go about generating one?

How can a random number be generated by a deterministic process?

How to do it with Excel?

How to do it with Stata?

Generating Random Numbers

What is a random number?

How would you go about generating one?

How can a random number be generated by a deterministic process?

How to do it with Excel?

How to do it with Stata?

```
drawnorm gauss, n(1000) sd(1) m(0) seed(8)
```

Intuitive explanation of degrees of freedom

From Wikipedia:

A common way to think of degrees of freedom is as the number of independent pieces of information available to estimate another piece of information. More concretely, the number of degrees of freedom is the number of independent observations in a sample of data that are available to estimate a parameter of the population from which that sample is drawn. For example, if we have two observations, when calculating the mean we have two independent observations; however, when calculating the variance, we have only one independent observation, since the two observations are equally distant from the mean.