Math 218 Mathematical Statistics

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Due Today. Page 231: 17–20, 22.

Due Monday. Due: From chap. 7, page 262, exercises 1, 2, 9, 11, 12.

Last meeting. Normal sample with known variance, any large sample: z-confidence intervals and hypothesis tests, hypothesis tests for the mean.

Today. We'll discuss 7.2.

t-confidence intervals and t-tests.

We consider the case when n is small, but we have a normal distribution with unknown σ^2. As we saw in chapter 6, the statistic

$$T = \frac{\overline{X} - \mu}{S/\sqrt{n}}$$

has a t-distribution with $n - 1$ degrees of freedom.

If $n \geq 30$, the t-distribution is so close to the z-distribution, the z-distribution is used instead. But for $n < 0$ (or so), the difference is sufficient to justify using the t-distribution. In between, it may depend on other things if it makes any difference which test to use.

The confidence intervals and hypothesis tests for a t-distribution with $n - 1$ degrees of freedom are the same as those for the z-distribution, except, of course, the distribution is different. In practice this means a different table is consulted. For the two- and one-sided cases for a z-distribution, a standard normal table is used to look up $z_{\alpha/2}$ or z_α, but for a t-distribution with $n - 1$ degrees of freedom, a t-table is used to look up $t_{n-1,\alpha/2}$ or $t_{n-1,\alpha}$.

Note that the t-table in our text, table A.4, has a very different format than the z-table, table A.3. To look up $z_{0.05}$, you find what value of z gives 0.95, namely, 1.645, but to look up $t_{9,0.05}$ (9 degrees of freedom, so $n = 10$), you look in line 9 under column $\alpha = 0.05$ to get 1.833. Note how the values in column 0.05 in the t-table approach 1.645 as n gets larger.