MAT 1372 Stat w/ Prob classwk 25 Spring 2012

**9.4 THE *t* TEST FOR THE MEAN OF A NORMAL**

**POPULATION: CASE OF UNKNOWN VARIANCE**

Recall that S is the sample standard deviation.

The random variable



is a *t random variable having n* − 1 *degrees of freedom*.

The t-distribution is similar to normal distribution except that it is flatter (more in the tails). As the degrees of freedom (number of data points − 1) increases, the distribution is closer to being normal.



As with the z test (known standard deviation), there are 2 and 1 tail versions. Recall that the *p* value is the probability that a value of the test statistic at least as

large as the one obtained would have occurred if the null hypothesis were true. To find the p value using the excel function “tdist”, there are 3 inputs.

The 1st input is the test statistic . The 2nd input is the degrees of freedom, which will always be one less than the number of data points for us. The 3rd input is the number of tails. If H0 is an equality, then input 2. If H0 is an inequality, then input 1.

9.4.2. A fast-food establishment has been averaging about $2000 of business

per weekday. To see whether business is changing due to a deteriorating

economy (which may or may not be good for the fast-food industry),

management has decided to carefully study the figures for the next

8 days. Suppose the figures are

2050, 2212, 1880, 2121, 2205, 2018, 1980, 2188

1. What are the null and the alternative hypotheses?

H0: μ=2000, H1: μ≠2000

**(b)** Are the data significant enough, at the 5 percent level, to prove

that a change has occurred?

**(c)** What about at the 1 percent level?

**(d)** find the *p* value.

We will be able to answer b,c,d by finding the p value. We calculate the sample mean and standard deviation (see excel file), then calculate and input the T statistic, the degrees of freedom (7) and the number of tails (2). The p value is 9.6%, so we do not reject H0 at either the 5 or 1% significance levels.

**4.** The number of lunches served daily at a school cafeteria last

year was normally distributed with mean 300. The menu has been

changed this year to healthier foods, and the administration wants

to test the hypothesis that the mean number of lunches sold is

unchanged. A sample of 12 days yielded the following number of

lunches sold:

312, 284, 281, 295, 306, 273, 264, 258, 301, 277, 280, 275

Is the hypothesis that the mean is equal to 300 rejected at the

**(a)** 10 percent

**(b)** 5 percent

**(c)** 1 percent

level of significance?

**14.** A manufacturer claims that the mean lifetime of the batteries it produces

is at least 250 hours of use. A sample of 20 batteries yielded the

following data:

237, 254, 255, 239, 244, 248, 252, 255, 233, 259, 236,

232, 243, 261, 255, 245, 248, 243, 238, 246

**(a)** Are these data consistent, at the 5 percent level, with the claim of

the manufacturer?

**(b)** What about at the 1 percent level?

Since the p value is 3%, we can reject the claim of the manufacturer at the 5% level but not the 1% level.