Homework No. 3 – Tests to look at differences

Introduction

Hypothesis testing is an important part of inferential statistics, and one of the three categories of statistical tests defined by Dytham (2003). There are six basic steps to conducting a hypothesis test:

1. State the null hypothesis Ho.
2. Choose an appropriate alternative hypothesis Ha; keep in mind that it might be one-sided.
3. Choose a significance level of size α.
4. Select the appropriate test statistic, and establish the critical region (e.g., $t_{critical}$).
5. Compute the value of the test statistic from the sample data (e.g., $t_{calculated}$).
6. Make a decision, which can be worded two ways:
    a. reject Ho if the test statistic has a value in the critical region; otherwise, fail to reject Ho.
    b. reject Ho if the probability associated with the test statistic is larger than the significance level of size α.

Objective

In this assignment you will practice conducting hypothesis tests to look at differences. These will include tests of differences in shape of distributions, and differences in parameters of distributions.

Instructions

Find the solutions to the questions on the following page using Microsoft Excel. Submit your answers in a professional memo. Also, for each question, summarize the appropriate statement or value to go with the six steps to conducting hypothesis tests.

This assignment is due in one week, at the beginning of class on Monday February 18, 2008.

Questions

One: The distribution of final (course) grades in FW4130 last year was as follows:

Letter grade	A	AB	B	BC	C	CD	D
Frequency	8	9	8	6	2	4	0

Was the distribution uniform? Test this hypothesis, using α = 0.05.

Two: In the first quarter of 2006 the mean value for sugar maple from timber sales in your management unit was $661.23 per MBF. This spring, a sample of eight timber sales showed bid prices for sugar maple were, per MBF, $757.56, $687.95, $806.65, $657.40, $666.13, $676.87, $655.00 and $673.80. Test the hypothesis that the average this year is greater than the average last year. Use α = 0.025 and assume the population is approximately normally distributed.

Three: The Michigan DNR wants to determine if winter use of conifer stands by deer is enhanced by marking guides that favour retention of conifers. A sample of treated mixed northern hardwood stands are selected, and ten 3 m by 100 m transects are walked in each stand to count the number of groups of deer pellets found. The data are as follows:

Treatment	*Pellet Groups*						
No retention	102	86	98	109	92		
Retention	81	165	97	134	201	87	114

Test the hypothesis that the average number of pellet groups in the retention treatment exceeds that in the no retention group by more than 10. Use α = 0.1.

Four: A forest consultant is trying to decide between two methods for measuring tree height. The two options are clinometer plus tape reel ("manual") and an electronic hypsometer/clinometer device ("electronic") that is more expensive. Twelve field staff were asked to measure the time taken to measure the height of a sample of trees using the two methods. The time taken, in minutes per tree, was recorded as follows:

Method	***Staff Member No.***											
	1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***
manual	4.2	4.7	6.6	7.3	6.7	4.5	5.7	6.0	7.4	4.9	6.5	5.2
electronic	4.2	4.9	6.2	6.9	6.8	4.4	5.7	6.0	6.9	4.7	6.5	4.9

Using α = 0.05, can we conclude that height measurements are faster using the electronic tool?