

Assignment 5 – Tests to look at multiple differences

Introduction

Analysis of Variance (ANOVA) is a technique to test several groups simultaneously to identify whether one or more pairs of groups are statistically different. ANOVA is most commonly used with designed experiments, but can also be used for observational data. If the ANOVA F-test reveals that at least one group is different, then post-hoc tests, such as the LSD test, may be used to compare groups pair-wise.

Instructions

Find the solutions to the questions on the following page using Microsoft Excel. Submit your answers in a professional memo. Be certain to summarize your analysis very briefly and present your final results in tables or bar charts.

For each and every F-test and LSD test please state the conclusion of the test, and provide necessary empirical values. In other words, give either a) the p-value or b) the calculated and critical test statistic.

Please, if you're having trouble, ask for help! It's our job to provide help if you need it.

This assignment is due at the beginning of class on **Monday February 26**, 2007.

Questions

One: One of four levels of nitrogen fertilizer was randomly assigned to 20 northern hardwoods stands, and fertilizer broadcast applied post harvest. A conventional uneven-aged residual stand prescription was applied. Ten years later stand level basal area increment was measured. The following table summarizes the average yearly basal area increment for the 20 stands.

replicate	Nitrogen Application Rate (lb/ac)			
	0	100	200	400
1	1.04	3.38	3.72	3.27
2	1.96	2.34	3.75	3.23
3	2.67	3.37	3.52	3.16
4	2.14	3.12	2.36	4.45
5	1.23	2.46	4.27	4.01

- Does application of nitrogen fertilizer affect basal area increment? If so, which levels of fertilizer are statistically different?
- Summarize your results in a bar chart and calculate and plot confidence intervals as error bars.
- Calculate a confidence interval for each factor level (nitrogen application rate) independently, as if they were single, independent samples. How do the widths of these intervals compare to those you calculated in b)?

Two: The same experiment as above was repeated, with only three levels of fertilizer, but this time crossed with three tree selection methods.

	Nitrogen Application Rate (lb/ac)		
	0	100	200
faller-select	1.43	2.17	3.26
standard	1.80	3.10	3.99
High thin	1.16	2.48	3.70

The same target residual basal area was used in all three tree-selection methods. The standard method is the usual mark-to-cut uneven-aged residual stand prescription. Faller-select means the faller selected the trees to cut during harvest, instead of marking the trees to cut beforehand. “High thin” means the trees marked to cut were all of the biggest trees in the stand.

Does application of nitrogen increase basal area increment? Does tree selection method affect basal area increment? Which levels are different from each other?