STAT 802 Applied Multivariate Analysis Nov. 7, 2005

Today: Ch 6 Comparisons of Several Multivariate Means
Tips on Presentations

Extension of univariate tests to p-variables

paired t -> $T^2 = n(\overline{D}-\delta)'S_d^{-1}(\overline{D}-\delta)$

where $\overline{D}$ is the mean of the n p-vector observations (is p x 1)
and
S_d is the usual covariance estimate but based on the n x p matrix of paired differences.

(same distribution theory as from Ch 5 for T^2). pp 272-275.

To absorb typical situation for this multivariate paired T^2 see Table 6.1.

Discussion p 276 discusses the apparent contradiction in this instance between
i) simultaneous 95% CIs include 0
ii) H_0: $\delta=0$ is rejected at .05 level.

The reason is that the simultaneous CI's have to apply to all linear combinations of the component means. The particular ones chosen here (collapsing to the component CIs) are only two such. As long as some linear combinations are outside the simultaneous CI, the H_0: $\delta=0$ would be rejected. Reminder: see Fig. 5.2 p 227.

Note the design of the paired comparisons expt p 277.

Above is q=2 paired treatments on p variables.

Now consider q>2 "repeated measures" treatments on p=1 variable for n individuals (items). Need to decide what comparisons are of interest. See two common choices p 279. Contrast matices for comparing mean responses of all treaments with a "standard" treatment, or comparing mean response for successive treatments. Box p 279 for F test. Note important comment T^2 does not depend on C! But of course confidece region would.

Confidence regions and intervals p 280.

Example p 281.

Note: How confident would you be of the results of these formulas? Need graphs too? Sensitivity analysis?

Section 6.3: $q=2$ indept samples of p-variate. n_1 and n_2. Samples have same p-variables but likely different sample sizes. Want to know if mean vectors identical.

For small sample sizes, need normality and equi-covariance.

T^2 statistic p 285 - uses pooled estimate of covariance. Necessary?

Soap example p 286-7

What to do when equi-covariance assumption unacceptable? p 290 ff. Same as in univariate case – don't pool.

Manova: g populations, p-variate $\{n_i\}$ observations in group $i=1,...,g$ p 293

Assume normality, equi-covariance. Model box p 298.

Compare W with B (like univariate) but here W, B covariance matrices. Analogous Wilks Λ . Variances are replaced by generalized variances. See figure p 126 and formula showing proportionality to volume spanned by deviation vectors. Algebraically, generalized variance is the determinant of the covariance matrix.

See p 299 bottom for definition of Wilks Λ.

Distribution theory for Wilks Λ known for $p = 1$ (any g) and for $p \geq 1$ if $g=2$ or 3.

Exercise: Due anytime before Dec. 5. Ex 6.19 and Ex 7.25.

About presentations:

From e-mail:

> I was asked about the handout ....
>
> The handout should be 1-2 pages - It does not have to include everything you say - just something to help the audience understand and follow your presentation. If there is enough to enable students to remember what you did, if they look at the handout later, this would also be useful.
>
> I think 1 page should be enough but maybe two pages if there is a graph or two.
>
> It is important that your message be included in what you say and show, not (only) in your paper hand-out.

Other tips:

Make type big if showing on screen or OH projector.

Not too much per page.

Brief handout!

Face class (when possible).

Keep track of time (not counting interruptions)

Check if audience is with you. Repetition is OK.

Ask for questions or comments at end.