QUERIES

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QUERY: A recent query (107, March, 1954) presented an inter-
114 esting discussion of some points on Sheppard's correction. I
would like to raise some additional points on application of the
correction in making tests of differences between means or analysis of
variance tests. The pertinent reference again is Fisher. I also checked
M. G. Kendall's "Advanced Theory of Statistics".

In my case I was supplied with a set of data in frequency distribution
form. Unfortunately, the class interval was rather wide, 200 units,
while the estimated standard deviation was about 270 units (based on
the grouped data). On the other hand, the data included the means
calculated from the original ungrouped observations for each treatment
combination.

After completing the analysis without correction, it occurred to me
that perhaps the matter of Sheppard's correction should be considered.
Hence, I checked the references noted above, but was not satisfied
with the information obtained. That is, I was not told exactly why the
correction was not to be applied for tests of significance even though it
seemed to be appropriate for estimation.

In my situation it appeared to me that since I had means based on
original data it might be appropriate to apply the correction for esti-
mating the variance of a difference between means. Upon carrying
out the necessary calculations, I found the correction to the second
moment to be large, but the actual effect on the final value of Student's
t or a normal deviate, Z, to be negligible.

In discussing the matter with a colleague this point of view was
suggested: When both the mean and standard deviation are calculated
from a grouped frequency distribution, the two statistics are both in
error by some amount and the direction of the error for the mean is
unknown. Thus, one might recommend, as does Fisher, "do not apply
the correction for tests of significance" and the long-run results should
be all right.

Question: (1) What is the real basis for Fisher's advice? and (2)
Was I right in not applying Sheppard's correction for my case?

ANSWER: The basis of Fisher's advice was that grouping introduces
an additional component of variance of which the magni-
tude is known on the assumption of perfect grouping, e.g.
that the true measurements of those classed as 17 units do all lie between
16.5 and 17.5 exactly, and are all that lie between those limits. For an

analysis of variance the effect is simply to add this fixed quantity to all mean squares, so reducing the probability that they should be unequal at any chosen ratio. In effect, errors of grouping, like other errors of random sampling, lower the precision with which any comparison can be made. Their exact and particular effects are always unknown, although the average magnitude is known, and is what is removed from the variance in making Sheppard's correction.

In your case errors of grouping have not been introduced in calculating the means to be compared, but only in calculating the estimate of error. I should, in such a case, apply the correction to the latter before testing the significance of the former.

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