Discussion

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If I might start with a light touch, I would point out that by selecting the last letter of the word "effect" rather than the third letter of that word, as used by Kish and Frankel, we would get DEFT rather than DEFF. The implications of the modified term seem quite appropriate.

In dealing with advantages of half-sample, jackknife, and related methods, we should not neglect the advantages of these methods in showing the client actual examples of varying numbers. This can give the naïve client a much better grasp of the true situation. (This point is made in the abstract of the paper in Session 63 by Mr. Gedanken.)

One important point about the use of the jackknife--in which, rather than leaving out half of the available data, one leaves out smaller pieces in turn until all has been left out once--is its ability to be used at two or more levels. If one had used the jackknife method rather than the half-sample method to obtain the DEFF or DEFT values, as in Kish and Frankel's situation, one could go ahead to estimate the stability of these results, or of their differences, or their ratios. By doing this we would have a better understanding of what these results, as well as many others, really mean.

The technique is simple in principle, but often not easily grasped without detailed exposition. The basic idea in dealing with a DEFT, for example, would be to lay aside one piece of the data and then calculate the DEFT by jackknifing the remainder. This jackknifing would involve leaving out additional pieces of the data, one at a time, and in turn. Once this has been done for one first-stage piece, we proceed to do all this over again and again, laying aside each piece of the data at the first stage in turn. We now have one value of DEFT corresponding to the laying aside of each piece at the first stage. Once we have repeated all this once more, leaving out nothing at the first stage, we are ready to jackknife the DEFTs thus obtained and thus estimate their variability. (For a more detailed account of this general sort of procedure, see the chapter by Mosteller and myself "Data Analysis, Including Statistics" which will appear in the next few weeks in the second volume of the second edition of the HANDBOOK OF SOCIAL PSYCHOLOGY edited by Gardner Lindzey and Elliot Aronson and published by Addison-Wesley.)

It seems to me that there will, in the two-psu-per-stratum situation faced by Kish and Frankel, prove to be real advantages to a suitable jackknife procedure--one that leaves out more than one psu, but less than half of all psu's. If we have five strata, each with two psu's, the half-sample method requires leaving out one psu in each strata, which can be done in 32 ways. A probably sensible jackknife approach would involve leaving out one psu in each of, say, two of the five strata. There are 40 possible ways to do this. The gain will come from leaving out enough, but noticeably less than half of the data.

Some work on the jackknife in situations with two-way classification, situations similar but not equivalent to this two-psu-per-stratum case, is included in an unpublished Princeton thesis by Donald Burdick. Extensions to the situation just mentioned should also, it would seem, proceed smoothly.

A simple example on which to compare "jackknifing" and "halving" is the problem of data gathered in several blocks with three values, equally spaced in time, obtained in each block. This sort of data arises naturally in many agricultural problems (including time of planting and time of harvesting). Yates (private communication) suggested that, where the number of blocks was a power of two, we treat such situations by halving the data and comparing the halves, repeating this in an interesting and ingenious way according to a fractional factorial pattern, thus obtaining the full number of degrees of freedom for the variability estimate.

Analysis of this problem shows that the bias due to halving--both in the location of the optimum data and in the estimate of the variance of this optimum data--is noticeably larger for halving than for "leaving out one" jackknifing, which also provides the full number of degrees of freedom for a variance estimate. I believe we can expect to find this phenomenon rather general. Accordingly, I believe that "leave out a few" techniques will do even better than halving in the two-psu-per-stratum situation.

I am pleased to see the interest in, and active use of all these methods. I am sure we will see much more of it.

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SURVEY ANALYSIS: USES OF CLUSTER AND PATTERN RECOGNITION TECHNIQUES

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