THE ROBUSTNESS OF CRONBACH'S ALPHA CONFIDENCE INTERVAL ESTIMATES TO VIOLATION OF THE NORMALITY ASSUMPTION

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ABSTRACT

If research involves use of some type of measurement instrument, then it is very likely to report Cronbach's coefficient alpha as an indication of the instruments reliability. While alpha is a useful descriptive indicator of internal consistency reliability for a measurement instrument for a particular group of subjects, it has the usual problems of a point estimator as an indicator of reliability in an inferential sense. A useful addition to indicate the precision of a point estimate is a confidence interval. In a previous simulation study only two of four possible methods to compute the confidence interval for alpha were shown to be accurate when the required assumption of normality of the item distributions was met, the classical and bias corrected and accelerated bootstrap method; however, violation of the normality assumption has received only minimal attention. The purpose of this study is to investigate the possible distortions to the accuracy of the two methods of producing confidence interval estimates of alpha when the item distributions are not normally distributed by use of simulation. In actual application, the items of the measurement instruments that report alpha will almost never meet the assumption of normality. The first problem is that typical instrument items are invariably based on a discrete Likert measurement scale, often using only five or at most seven points giving at best, a poor approximation to normality. The second problem is that the center point of these Likert scales is usually designated as a neutral response phrased something like "neither strongly agree nor disagree." This neutral response is not intended to illicit the maximum response frequency by design, but to provide a discrete approximation to normality, the maximum response would have to occur at this neutral response. In investigating the empirical distributions of 55 actual Likert scale items used in pilot measurement instruments, none was found to even be close to a normal approximation. Of the items retained for the final instruments, the majority were distinctly skewed left with a few skewed right or somewhat bimodal in distributional shape. Based on this information, two conditions of non-normality were used for the actual simulation. First, the normality assumption was allowed to hold, but the effects of converting to a five or seven point Likert scale was studied. Such a crude discrete approximation to a continuous normal distribution could by itself have a serious effect on confidence interval estimation. Secondly, a measurement instrument with five or seven point Likert scaled items highly skewed left was investigated. This distributional distortion represents a serious violation of the normality assumption.

To investigate the effects of non-normality on alpha confidence intervals, it was decided to use real data as the basis for deciding on the population parameters used to generate the simulated samples. Since the basic distributional assumption of the parametric methodologies employed was normality and independence, samples of an 8 item instrument with 50 respondents were initially generated from a multivariate normal distribution with a mean vector of zeros and an identity variance-covariance matrix. Then, if required, the desired degree of skewness was introduced by use of Tukey's g-distribution (g set to.8). Then by use of Cholesky-factorization of the population variance-covariance matrix and simple addition of the desired mean vector, the standardized sample data was converted to sample data with the desired characteristics. Finally, the continuous data was converted to the desired five or seven point

Likert scale. The level of confidence used in constructing all CIs was 95 percent. Preliminary results indicate problems with the accuracy of alpha confidence interval estimates for both the classical and bootstrap methods when the assumption of normality is violated.