INFORMATION POINT:

Factor analysis

In many areas of psychology, sociology and healthcare it is not always possible to directly measure the concepts that are of major interest, for example, intelligence, satisfaction or quality of life. In situations like that the researcher often collects data on variables likely to be indicators of the concepts under consideration and then tries to ascertain whether the relationships between these observed variables are consistent with them being measures of a single underlying unobservable variable. The method of analysis frequently used in such circumstances is factor analysis.

Factor analysis is a multivariate analysis technique aimed at reducing the number of variables, whilst preserving as much of the original information as possible. Factor analysis postulates that underlying the m variables that we have observed there are a smaller number p of common factors, unobservable variables. Each of the m observed variables is assumed to be a linear combination of the factors (unobserved variables) plus an error term.

A factor analysis is usually carried out in two steps. The first one is to carry out a principal component analysis to produce a solution to the complex set of equations. The second is to rotate the solution to produce a solution of simpler form. Often the rotation method chosen is called Varimax, which aims to get as many as possible of the weightings of variables on factors to be close to either zero or one. Such weightings will make it easier to interpret the factors. Often only variables with rotated weightings greater than 0.4 are included in scales to represent the factors, as in the paper preceding this information point. Everitt (1994) discusses this in more detail, with examples.

Factor analysis does not provide a unique solution. The number of factors would usually be determined by considering how well the model fits the data. Often a scree-test is used for this (Everitt & Dunn (1991)). In the preceding paper the authors only wanted to consider the first factor.

Further reading

Everitt B.S. (1994) *Statistical Methods for Medical Investigations*. Edward Arnold, London.
Everitt B.S. & Dunn G. (1991) *Applied Multivariate Data Analysis*. Edward Arnold, London.

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