On Parametric Nonlinear Factor Analysis

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ABSTRACT

Structural equation modeling using latent variables or factors has been used widely in social and behavioral sciences, and is a useful tool for exploration and model fitting in multivariate analysis. The conventional models used in such analyses are linear in factors, addressing only the underlying linear structure of multivariate data. Also, the traditional model fitting procedures are based on the sample covariance or correlation matrix. In applications to applied sciences, such linear models can be unrealistic even as an approximation, and often do not fit the data well. Models nonlinear in factors have not been used in practice. Here, a general parametric nonlinear factor analysis model is considered, and its identification using the errors-in-variables parameterization is proposed. Two procedures for fitting such a model to multivariate data are introduced and described. Tests for the goodness of fit of the model are also proposed. The procedures are studied through a simulation study. An example from personality testing is used to motivate and illustrate the methods.