

# A Marginal Maximum Likelihood Approach for Extended Quadratic Structural Equation Modeling with Ordinal Data

## Abstract

The literature on non-linear structural equation modeling is plentiful. Despite this, few studies consider interactions between exogenous and endogenous latent variables. Further, it is well known that treating ordinal data as continuous produces bias, a problem that is enhanced when non-linear relationships between latent variables are incorporated. A marginal maximum likelihood-based approach is proposed to fit a non-linear structural equation model, including interactions between exogenous and endogenous latent variables in the presence of ordinal data. In this approach, the exact gradient of the approximated observed log-likelihood is calculated to attain the approximated maximum likelihood estimator. A simulation study shows that the proposed method provides estimates with low bias and accurate coverage probabilities.

## Bio

Fan Y. Wallentin is a Professor of Statistics at Uppsala University, Sweden. She received her Ph.D. in Statistics in 1997. She is a recipient of the Arnberg Prize from the Swedish Royal Academy of Sciences. Dr. Wallentin's research program is on the theory and applications of latent variable modeling and other types of multivariate statistical analysis, particularly their applications in the social and behavioral sciences. She has published research articles in several leading statistics and psychometrics journals. She has taught courses related to latent variable modeling in Sweden, USA, China, and several European countries. She has broad experience in statistical consultation for researchers in social and behavioral sciences.