



PLS Path Modeling with Ordinal Data

Simona Balzano, Giovanni C. Porzio, Laura Trinchera

► **To cite this version:**

Simona Balzano, Giovanni C. Porzio, Laura Trinchera. PLS Path Modeling with Ordinal Data. 34th Annual conference of the German Classification Society (GFKL'10), Jul 2010, Karlsruhe, Germany. pp.54. hal-00528579

HAL Id: hal-00528579

<https://hal-supelec.archives-ouvertes.fr/hal-00528579>

Submitted on 22 Oct 2010

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

PLS Path Modeling with Ordinal Data

Simona Balzano¹, Giovanni C. Porzio¹, Laura Trinchera²

¹ University of Cassino, Italy, s.balzano@unicas.it, porzio@eco.unicas.it

² SUPELEC, France, laura.trinchera@supelec.fr

Abstract. Structural Equation Models (SEM) (Jöreskog, Sörbom 1979) are strictly related to consumer analysis, as they suit situations where a set of unobservable phenomena (called latent variables) can be described through sets of observable variables (called manifest variables). Among the methods for estimating SEM, in this paper we focus on PLS Path Modeling (Tenenhaus et al., 2005). However, in consumer analysis manifest variables are often expressed on an ordinal scale, as they represent judgments about some qualitative aspects. This yields incoherence with respect to the linearity hypothesis that underlie PLS Path Modeling. For this reason, it is worth to consider how PLS Path Modeling may be adjusted for the analysis of ordinal data, a topic that has found increasing interest in recent times (e.g. Jakobowicz, Derquenne, 2007; Lauro et al, 2008; Russolillo, 2010). After a review of the existing literature, in this work we propose a new approach, based on ordinal logistic regression (Agresti, 2002), aiming both at accounting for non linearity and at drawing a continuous scoring criterion for ordinal categories. Depending upon the causal relationships between manifest and latent variables (defining the so-called measurement model), we can incur in two alternative models: one (called reflective model) is defined as a set of simple regression models, each with ordinal response variable and continuous predictor, the other (called formative model) is defined by a multiple regression model with ordinal predictors. We address our main interest to the former case.

References

- AGRESTI, A. (2002): *Categorical Data Analysis*. Wiley.
- JAKOBOWICZ E., DERQUENNE C. (2007): A modified PLS path modeling algorithm handling reflective categorical variables and a new model building strategy. *Computational Statistics and Data Analysis*, 51(8), 3666-3678.
- JÖRESKOG K.G, SÖRBOM D. (1979): *Advances in Factor Analysis and Structural Equation Models*, Cambridge, Massachusetts, Abstract Books.
- LAURO C.N, GRASSIA M.G., NAPPO D., MIELE R. (2008): *Methods of quantification of qualitative variables and their use in Structural Equation Models*. Book of short papers SFC-CLADAG, Caserta.

RUSSOLILLO G. (2010) *PLS methods for Non-Metric data*, PhD thesis, Università degli Studi di Napoli Federico II, Italy.

TENENHAUS M., ESPOSITO VINZI V., CHATELIN Y.M., LAURO N.C. (2005): PLS Path Modeling. *Computational Statistics and Data Analysis*, 48, 159-205.

Keywords

Ordinal Logistic Regression, PLS Path Modeling, Structural Equation Models