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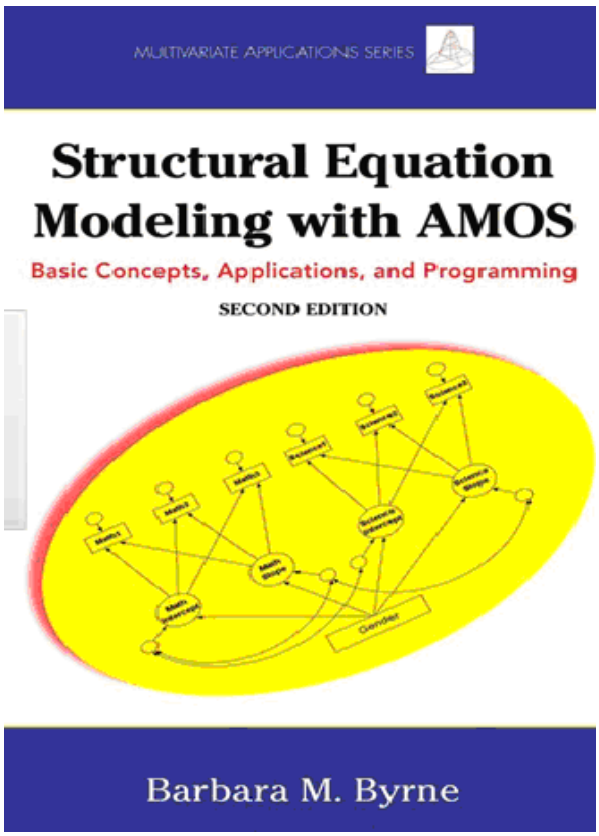
Book Review
STRUCTURAL EQUATION MODELING WITH AMOS: BASIC CONCEPTS, APPLICATIONS AND PROGRAMMING
(2nd ed.)
by Barbara M. BYRNE,
Routledge/Taylor & Francis, New York



One of the most imperative statistical and methodological innovations within area of psychology and education over the last few decades concerns the introduction of structural equation modeling (SEM). SEM links regression analysis to factor analysis. A factor model can be specified for the relationships among sets of items tapping the latent variables underlying these items; at the same time, a regression model can be specified for the relationships among these latent variables. One main advantage of SEM over other multivariate approaches is that it reduces the influence of measurement error on these regression estimates, as such errors are already "partialled out" in the factor model. A further advantage is that models can be specified and tested in details; for example, whereas traditional exploratory factor analysis assumes that all items load on all underlying dimensions, in SEM specific factor models can be specified and tested. Yet another advantage is that the fit of a model to the data can be tested and compared to the fit of competing models, thus allowing researchers to see which theoretical notions are supported empirically (Teo & Khine, 2009).

One of the most popular SEM software is that of James Arbuckle; the AMOS program. It features a sophisticated graphical interface that makes the model specification simple and the analysis output much easier to read. Furthermore, because model specification is so much easier, in my experience, users tend to make much fewer errors in specifying models than using other SEM software with no graphical interface.

Although the user's manual (Arbuckle, 2009) does a fantastic job in discussing the basic features and operation of AMOS, it falls short in two respects. First, although model specification is easy, users still have to translate their research questions into the right model (or series of models). Second, on a more theoretical level, it is important to realize that model specification is part of the job; SEM comes with a highly structured set of methodological strategies and notions that must be understood before it can be applied effectively.

One of the true virtues of the second edition of Barbara Byrne's book, Structural Equation Modeling with AMOS, is that it deals quite well with these two issues. According to the Preface "....overall goal is to provide readers with a nonmathematical introduction to basic concepts associated with structural equation modeling (SEM), and to illustrate basic applications of SEM using the AMOS program." All applications in the book were based on the AMOS 17.0 program.

The second edition of the book is different from the first edition in several aspects. First, the number of applications has been expanded to include the testing of: a multitrait-multimethod model, a latent growth curve model, and a second-order model based on categorical data using a Bayesian statistical approach. Second, an update was implemented concerning the automated multi-group approach to test for equivalence. Third, data derived from the use of Likert scaled measures was analyzed using both continuous and categorical approaches. Fourth, there was an update concerning the AMOS text output files which are now imbedded within cell format. Fifth, all applications are based on the graphical mode only of the program. Thus, in contrast to the first edition of this book, example input files for AMOS based on a programming approach (formerly called AMOS Basic) are not included. Finally, all data files used for the applications in this book have been uploaded on a new website: http://www.psypress.com/sem-with-amos/

The book is divided into five major sections. The first section discusses the basics of SEM, and presents a general introduction to model specification in AMOS. The remaining four sections deal with applications of AMOS to exemplary real life data sets drawn from Byrne's own archives. The second section is devoted to applications involving single-group analyses (i.e., analyses in which data are available for one group only; no across-group comparisons are made). This section addresses simple applications such as testing first- and second-order factor models and "causal" models (i.e., models in which some variables are presumed to affect other variables in the model causally). The third section discusses more complicated multi-group analyses (analyses in which models are compared across different groups; e.g., does the same model apply to boys and girls? can we cross-validate a particular model using data from another group?). The fourth section tackles construct validity via the multitrait-multimethod model and change over time via the latent growth model. The fifth section addresses the analysis of non-normal data using the bootstrap and missing values or incomplete data.

All chapters in these five sections follow the same format. First, a substantive research question is introduced; then the model corresponding to this research question is

presented and applied to a data set; next the output for this analysis is presented and discussed. Thus, the book can be used as a sort of cookbook; if this is the question you want to address, then this is your model and this is how you should interpret your results. The success of such an approach depends on the range of models considered. That is, by this approach readers are getting familiar with a limited number of models only. Although the readers will be able to modify these models to some degree, they may be more or less helpless when confronted with research questions or data types that require a wholly different approach.

Fortunately, Byrne covers most of the grounds relevant to education and psychology researchers. There is one exception to this general rule. Many psychological theories distinguish between main and moderator (or interaction) effects of the variables included in these models. For example, educational and psychological researchers may examine the effect of pay increase on teachers' job satisfaction, while acknowledging that these effects may vary as a function of teachers' educational qualifications. Given the importance of this issue and the fact that specification of interaction effects is not exactly easy in SEM, I would have expected some attention for this issue in this book.

Overall, Byrne's book is a valuable source to those who seek to analyze their data with SEM techniques because it addresses most of the problems readers will encounter in their own research. The remarkable features including clear style, rich illustrations of a comprehensive range of topics based on real empirical data, and simple-to-follow examples have made this book the first choice by researchers, teachers, students, and other for clearly understandable input and examples on applying SEM with AMOS.

References

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