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A STUDY ABOUT STRUCTURAL EQUATION MODELING (SEM) AND ITS MODELS - AN OVERVIEW

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Abstract:- *Research can be referred to as the systematized efforts to gain new knowledge. Usually in order to interpret the results of a business research we will be using many tools such as Chi Square, F,T,ANOVA, etc for which we will be using software such as POM,TORA,SPSS etc. The Hybrid and Upgraded version of such software is now available for the researcher to undertake research effectively and its popularly known as SEM Modeling .Structural equation modeling (SEM) has become a mainstream method in many fields of business research, but its use in family business research remains in its infancy. This lag in SEM's application holds especially true for partial least squares SEM (PLS-SEM), an alternative to covariance-based SEM, which provides researchers with more flexibility in terms of data requirements, model complexity and relationship specification. This article draws attention to PLS-SEM as an opportunity to advance the development and testing of theory in family business research by providing a non-technical introduction into the basic concepts and issues of PLS-SEM, bearing the needs of potential users in mind. To this end, a systematic procedure for PLS-SEM results evaluation is presented and applied to an annotated example. The article also illustrates the analysis of mediating effects, which researchers are increasingly testing in their models. This article deals in detail about the various aspects of SEM Modeling in Business research using Secondary Data as a Source.*

Keywords: Structural Equation Modeling, Partial Least Squares, Business Research

INTRODUCTION

•Structural equation modeling (SEM) is a general term used to describe a family of statistical methods designed to test a conceptual or theoretical model. Some common SEM methods include confirmatory factor analysis, path analysis, and latent growth modeling. This article deals in detail about the various aspects of SEM Modeling in Business research

Objectives of the Study

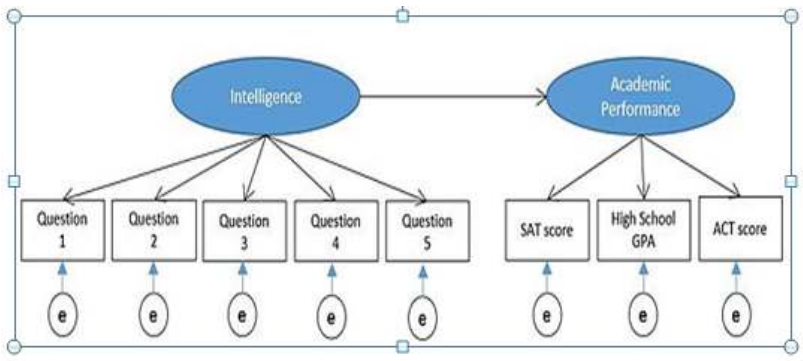
- To understand the theoretical background of SEM Model
- To know about the applications of SEM Model in Business Research
- To study about Partial Least Squares Method Modeling and to know about the various Software available to work out the same

Structural Equation Modeling (SEM)-An Introduction

Structural equation modeling, or SEM, is a very general, chiefly linear, chiefly cross-sectional statistical modeling technique. Factor analysis, path analysis and regression all represent special cases of SEM.SEM is a

largely confirmatory, rather than exploratory, technique.
That is, a researcher are more likely to use SEM to determine whether a certain model is valid., rather than using SEM to "find" a suitable model--although SEM analyses often involve a certain exploratory element.In SEM, interest usually focuses on latent constructs--abstract psychological variables like "intelligence" or "attitude toward the brand"--rather than on the manifest variables used to measure these constructs.
Measurement is recognized as difficult and error-prone. By explicitly modeling measurement error, SEM users seek to derive unbiased estimates for the relations between latent constructs. To this end, SEM allows multiple measures to be associated with a single latent construct.A structural equation model implies a structure of the covariance matrix of the measures (hence an alternative name for this field, "analysis of covariance structures").
Once the model's parameters have been estimated, the resulting model-implied covariance matrix can then be compared to an empirical or data-based covariance matrix.
If the two matrices are consistent with one another, then the structural equation model can be considered a plausible explanation for relations between the measures.
Compared to regression and factor analysis, SEM is a relatively young field, having its roots in papers that appeared only in the late 1960s. As such, the methodology is still developing, and even fundamental concepts are subject to challenge and revision. This rapid change is a source of excitement for some researchers and a source of frustration for others.

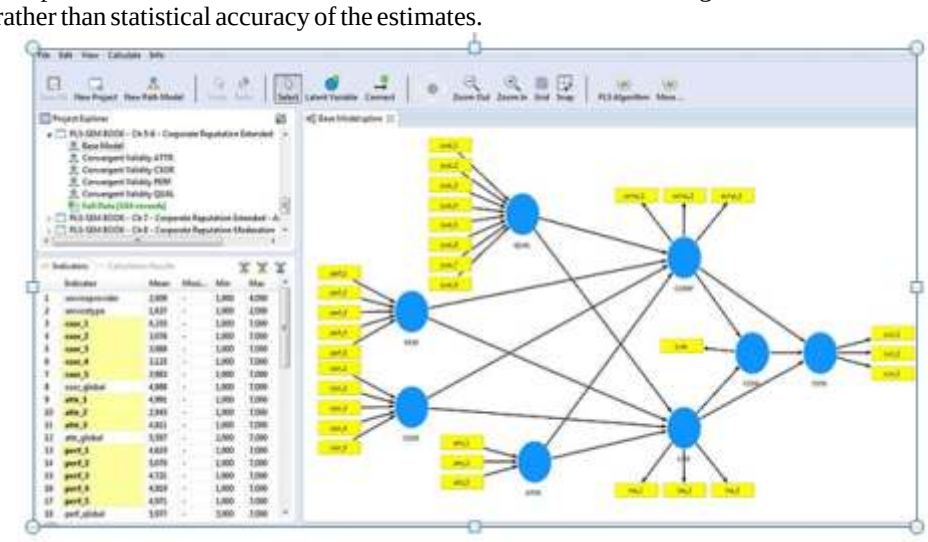
Conceptual illustration of a Structural Equation Model



Partial Least Squares Path Modeling

The partial least squares path modeling (PLS-PM, PLS-SEM) approach to structural equation modeling, is a component-based estimation procedure different from the covariance-based structural equation modeling approach.

Unlike the covariance-based approach to structural equation modeling, PLS path modeling does not reproduce a sample covariance matrix. It is more oriented towards maximizing the amount of variance explained (prediction) rather than statistical accuracy of the estimates.



The PLS structural equation model is composed of two sub-models: the measurement model and structural model. The measurement model represents the relationships between the observed data and the latent variables. The structural model represents the relationships between the latent variables.

An iterative algorithm solves the structural equation model by estimating the latent variables by using the measurement and structural model in alternating steps, hence the procedure's name, partial. The measurement model estimates the latent variables as a weighted sum of its manifest variables.

The structural model estimates the latent variables by means of simple or multiple linear regression between the latent variables estimated by the measurement model. This algorithm repeats itself until convergence is achieved.

PLS-SEM Specific Software

- **• Open source**
- R has several contributed packages dealing with PLS path modeling such as the sem PLS package.

• Commercial

- PLS-Graph
- PLS-GUI
- SmartPLS - Next Generation Path Modeling
- WarpPLS

R

R is a programming language and software environment for statistical computing and graphics. The R language is widely used among statisticians and data miners for developing statistical software and data analysis.

Polls, surveys of data miners, and studies of scholarly literature databases show that R's popularity has increased substantially in recent years.

R is an implementation of the S programming language combined with lexical scoping semantics inspired by Scheme.

S was created by John Chambers while at Bell Labs. There are some important differences, but much of the code written for S runs unaltered.

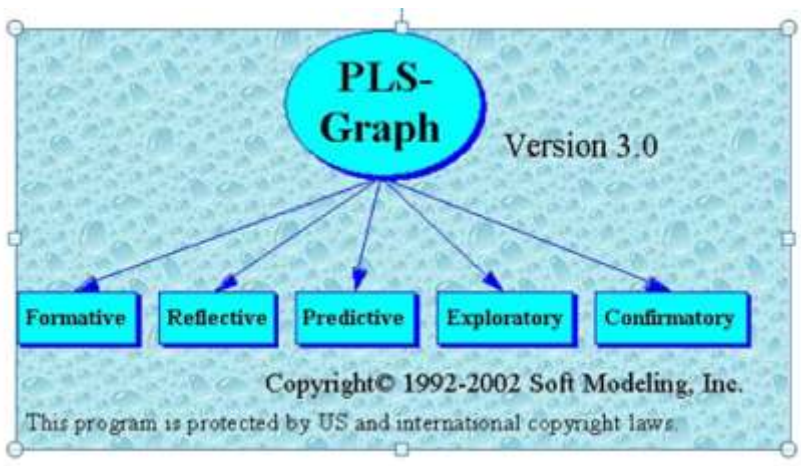
R was created by Ross Ihaka and Robert Gentleman at the University of Auckland, New Zealand, and is currently developed by the R Development Core Team, of which Chambers is a member.

R is named partly after the first names of the first two R authors and partly as a play on the name of S.

R is a GNU project. The source code for the R software environment is written primarily in C, Fortran, and R.

R is freely available under the GNU General Public License, and pre-compiled binary versions are provided for various operating systems. R uses a command line interface; there are also several graphical front-ends for it.

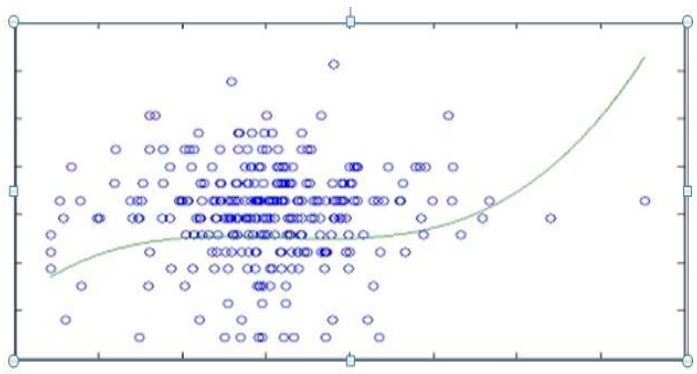
PLS-Graph



PLS-Graph provides a complete graphical user interface where analytical models can be drawn and results immediately placed back into the same drawing.

Partial Least Squares (PLS) can be a powerful method of analysis because of the minimal demands on measurement scales, sample size, and residual distributions. Although PLS can be used for theory confirmation, it can also be used to suggest where relationships might or might not exist and to suggest propositions for later testing.

WarpPLS™



WarpPLS is available through self-installing .exe files. These trial versions, valid for 3 months, are full implementations of the software, not demo versions. They are being used on various platforms, the most stable of which seem to be Windows (2000, XP, 7 and 8). Non-Windows users (e.g., Mac OS X and Linux users) are advised to create a Windows partition on their computers using virtualization software, of which one of the most popular is VMWare, and install WarpPLS on that Windows partition.

PLS-GUI

- Using appropriate PLS software, we can do the following functions,
- Consistent PLS estimation to avoid inflated loadings and deflated path coefficients
- How to examine for quadratic and other non-linear effects;
- Non-parametric kNN Nearest Neighbor and Iterative Robust Model-based Imputation (IRMI) methods
- New reliability, validity, and Goodness-of-Fit measures for PLS models
- Orthogonalizing moderating (interaction) effects for more reliable estimation
- Conditional process analysis to estimate combined, "cascading," mediated and moderated path model indirect and total effects
- How to reliably estimate significant differences between any pair of direct, indirect, or total effects
- How to automatically compute Variance Inflation Factors (VIFs) for any construct
- How to automatically compute Cohen's effect sizes (f-squared) for all exogenous latent constructs
- Prediction-oriented segmentation for "hidden" heterogeneous groups identification
- Genetic-algorithm segmentation for "hidden" heterogeneous groups identification
- Automatic N-group multigroup analysis (MGA)

CONCLUSION

SEM is very valuable method for developing and testing theories in business research. Various features and software available further increase the technique’s versatility, allowing researchers to test more complex relationships among the variables.

Currently the SEM PLS does not support moderating e? ects in an object oriented way, though they can be speci? ed manually. The plpm class will be extended to also support moderating e? ects. Further development plans are? to enhance visualization methods by making them more dynamic and better accessible by the user, e.g., to add grouping variables post-hoc,? to integrate a simulator function to draw samples from hypothetical models, thus opening the door to large scale Monte Carlo experiments, and? to develop new methods for dealing with unobserved heterogeneity. When these areas are covered, SEM can be a inevitable tool for Researchers in mere future.

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