Reliability and Stability on the Numerical Analysis in Structural Equation Modeling

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Abstract: Structural equation modeling has been widely used in various research studies and has been incorporated into many software programs such as Mplus, CALIS, EQS, LISREL, Amos and so on. At the meantime, the diversity, instability of the analysis results or no solutions has been found in some analysis models. Several problems on the numerical analysis such as the constraints of residual variance, initial values and the different solutions by software in use have also been found in SEM analyses. This paper discusses the reliability and stability on the numerical analysis in structural equation modeling by using four kinds of SEM programs and three kinds of sample data. The study will introduce an application of the optimized calculation of genetic algorithms (GA) in structural equation modeling in order to see elaborately what is going on with these issues and also to examine the goodness-of-fit, validity, stability and reliability of structural model. Furthermore, the empirical analysis is presented to discuss the above issue in the questionnaire survey data about drunken driving behavior in Bangkok.

Keywords: structural equation modeling, genetic algorithm, solver, Amos

1. INTRODUCTION

Structural equation modeling (SEM) is a methodology for representing, estimating, and testing a network of relationships between variables (measured variables and latent variables). SEM is called multivariate analysis with latent variables and also called causal modeling or covariance structure analysis. SEM is a valuable methodological tool that has gained popularity across many disciplines in the past two decades perhaps due to its generality and flexibility (Golob, 2003). Essentially the broad framework that includes many well-known procedures such as multiple linear regressions, factor analysis, path analysis; structural