A Spatio-Temporal Autoregressive SEM Model for Reducing Omitted Variable Bias

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ABSTRAK

Structural Equation Modeling (SEM) has been recognized as a powerful analytical tool. Nevertheless, SEM assumes that observations are independent. This assumption prevents us to apply SEM in spatial modeling in which observations depend on each other according to their position in a space. Here we propose to formulate a SEM for accommodating spatial dependency among observations. Particularly, we focus on spatio-temporal autoregressive model for reducing omitted variable bias in a spatial autoregressive model.

1. INTRODUCTION

Structural Equation Model (SEM) has been recognized as a powerful analytical tool for causal relationship. There are some advantages that can be obtained from SEM. First, SEM explicitly includes latent variables into a model. Second, SEM can be used to reduce the effect of attenuation caused by measurement errors. Third, SEM overcomes multicollinearity problem due to highly correlated explanatory variables belonged to a latent concept. These three advantages available in relation to the measurement model in SEM (Suparman et al., 2008). Finally, SEM handle endogeneity problem since the standard SEM is a simultaneous model (Joreskog and Sorbom, 1996).

The standard SEM assumes that observations are independent (Joreskog and Sorbom, 1996). Nevertheless, this assumption cannot be held in regional modeling. In regional modeling, often observation units relate to each other. And in many cases, dependences among regions are the main interest. Accordingly, the standard SEM cannot be used for modeling dependence among observations.

Folmer and Oud (2008) propose a spatial autoregressive SEM with one observed endogenous variable and fixed observed exogenous variables. Here, we extend Folmer and Oud's model with multiple observed endogenous variables. Particularly, we focus on a spatio-temporal autoregressive model for reducing omitted variable bias in a spatial autoregressive model.

2. CONCEPTUAL FRAMEWORK

A SEM, as introduced by notably Joreskog and Sorbom (1996), reads: