

Estimating Economic Relationships under Measurement Error

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Abstract

The paper proposes the use of the dynamic structure of the true series and measurement errors to identify the parameters of interest. The dynamics of the underlying time series are introduced into the model using a structural time series approach and the identification of the parameters of interest is achieved by a simple property of the multivariate normal distribution. This modeling framework has several advantages. The first is the possibility of incorporating more flexible components of the time series being studied, such as trends, cycles, and seasonality. The second is that the model allows for a non-zero correlation between the measurement errors of the variables involved in the structural relationship. The third is that using a multivariate normal distribution to derive the structural relationship between variables allows for the time-variation in the relationship. Two results are proved to show how the measurement error bias can be extracted and the parameters of the true relationship estimated. A simulation exercise demonstrates these results. An empirical illustration using data from the Bureau of Labor Statistics is used to revisit the modelling presented in Diewert and Fox (2008) where the issue of severe measurement error of inputs and outputs measures were made.