MODELING AGRICULTURAL PRODUCTION SYSTEMS USING MEASUREMENT ERROR VARIABLE APPROACH

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Measurement error models are regression type models where the response variable is functionally related to a predictor variable that is not directly measured. Naive analysis that ignores the presence of measurement error in predictor variables yields estimates of parameters that are attenuated or biased toward zero. Correction of measurement error assumes availability of one of the three types of data from a random sub sample of the data under study. The three types of data are, validation data with the true predictor *X* directly measured in the sub sample, replication data with replicates on the observed predictor variable *W*, and instrumental data with another measured predictor variable *T*, in addition to the observed *W* (Carroll et al., 2006). In practice, most research make use of secondary data collected for other purposes than the problem at hand, or are collected as by-products of some day to day activities, while at the same time they are subject to measurement error. Oftentimes secondary data do not entail any of the three types of data required for measurement error correction. This paper presents a variable approach of modeling measurement error, in which variables that are easy to observe, and unobserved variables are identified. The approach explores bivariate relationships between the two types of variables and takes the advantage of the existing relationships to measure unobserved variables. The unobserved predictor variables are expressed in terms of their functional relationship with the directly measured variables. The predicted values derived by exploiting the functional relationships are used as predictor variables in modeling agricultural production systems. Maize production data in Lesotho is used.

Carroll, R. J., Ruppert, D., Stefanski, L. A., and Crainiceanu, C. M. (2006). *Measurement Error in Nonlinear Models: A modern Perspective*. Second Edition. New York: Chapman and Hall/CRC.