ESTIMATING AND TESTING INTERACTIONS IN LINEAR REGRESSION MODELS WHEN EXPLANATORY VARIABLES ARE SUBJECT TO CLASSICAL MEASUREMENT ERROR

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Estimating and testing interactions in a linear regression model when normally distributed explanatory variables are subject to classical measurement error is complex, since the interaction term is a product of two variables and involves errors of more complex structure.

Our aim is to develop simple methods, based on the method of moments (MM) and regression calibration (RC) that yield consistent estimators of the regression coefficients and their standard errors when the model includes one or more interactions. In contrast to the available methods using structural equations models framework, our methods allow correlated errors and can deal with measurements of relatively low reliabilities.

Using simulations, we show that, under the normality assumptions, the RC method yields consistent estimators and standard errors and is superior to MM in both bias and variance. We also show that the RC method also yields the correct Type I error rate of the test of the interaction.

An example, using data from the Israeli Glucose Intolerance, Obesity and Hypertension (GOH) study, is provided relating homocystein to plasma folate and plasma vitamin B12 levels.

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