

Estimation of Output Measurement Variances for EVM Parameter Estimation

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Abstract

Error-in-variables model (EVM) methods require information about input and output measurement variances when estimating model parameters. In EVM, using replicate experiments for estimating output measurement variances is complicated, because true values of inputs may be different when multiple attempts are made to repeat an experiment. To address this issue, we categorize attempted replicate experiments as: i) true replicates (TRs) when uncertain inputs are the same in replicated runs and ii) pseudo-replicates (PRs) when measured inputs are the same, but unknown true values of inputs are different. We propose methodologies to obtain output measurement variance estimates and associated parameter estimates for both situations. We also propose bootstrap methods for obtaining joint-confidence information for the resulting parameter estimates. A copolymerization case study is used to illustrate the proposed techniques. We show that different assumptions noticeably affect the uncertainties in the resulting reactivity-ratio estimates.

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