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RESPONSE TO THE LETTER TO THE EDITOR

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GROVE emphasizes the added value of the proposed estimation techniques not only when obtaining parameter estimates to derive control chart limits for Phase II process monitoring, but also for robust parameter estimation in general. We support this statement. It is in line with what we had in mind when doing this research: instead of having a traditional robust estimator that trims off a fixed number of observations, the proposed methods are based on a way of dynamic trimming in which the number of observations that are trimmed off depends on the data at hand. When there are many outliers in the data, many observations are removed before final estimation. When the data are clean, only a limited number of observations are removed.

Besides this issue, Grove raises two points for improving the estimation methods. We would like to add some of our own considerations when we were doing this research.

Grove first points out that the estimation methods can be improved further by tightening the Phase I limits. He shows that tighter limits result in more robust control limits. We agree with this at least in terms of robustness. The difficulty, however, lies in the choice of the Phase I limits: setting them too tight would result in a decrease of efficiency for situations when the data are clean because then too many observations are deleted. Limits should be chosen by trial-and-error and their impact on the efficiency of the estimator in the in-control situation should then be observed. The tightest possible limits that result in a reasonably efficient estimator in the in-control situation should then be chosen. This procedure is a trial-and-error approach which requires simulation. Currently, there is no algorithm enabling practitioners to set the limits in this way. To summarize, we do agree with Grove that tightening the limits would result in a more robust estimator but some guidance for practitioners is needed on how to set these limits without too much effort. We see this as an issue for future research.

Another point he mentions is that it is important to use a robust estimator to obtain the estimates for the Phase I chart limits. This is an important point when using these techniques, and we have covered this issue in subsequent research. Our research showed that, when large deviations are present in the Phase I data, the initial estimate as well as the Phase I limits are biased. As a consequence, the wrong observations are removed from the Phase I dataset and a biased dataset remains for the final estimation. In subsequent articles we have proposed the use of a two-step procedure: a very robust estimator is used for the mean (standard deviation) to construct the Phase I location (dispersion) control chart; after screening, a common, efficient estimator is used to estimate the parameters from the screened dataset. This leads to much better estimates in cases where there are large deviations in the Phase I dataset. An added advantage is that, due to the use of an efficient estimator for final parameter estimation from the screened dataset, the efficiency of the estimator in the in-control situation does not decrease. These results can be found in Schoonhoven and Does (2012) for the dispersion control chart and in Schoonhoven et al. (2013) for the location control chart.

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