Qual Quant
DOI 10.1007/s11135-008-9175-x

ORIGINAL PAPER

A new procedure for monitoring the range and standard deviation of a quality characteristic

M. Kiani · J. Panaretos · S. Psarakis

Abstract The Shewhart and the Bonferroni-adjustment R and S chart are usually applied to monitor the range and the standard deviation of a quality characteristic. These charts are used to recognize the process variability of a quality characteristic. The control limits of these charts are constructed on the assumption that the population follows approximately the normal distribution with the standard deviation parameter known or unknown. In this article, we establish two new charts based approximately on the normal distribution. The constant values needed to construct the new control limits are dependent on the sample group size (k) and the sample subgroup size (n). Additionally, the unknown standard deviation for the proposed approaches is estimated by a uniformly minimum variance unbiased estimator (UMVUE). This estimator has variance less than that of the estimator used in the Shewhart and Bonferroni approach. The proposed approaches in the case of the unknown standard deviation, give out-of-control average run length slightly less than the Shewhart approach and considerably less than the Bonferroni-adjustment approach.

Keywords Shewhart · Bonferroni-adjustment · Average run length · R chart · S chart

M. Kiani · J. Panaretos (✉) · S. Psarakis
Department of Statistics, Athens University of Economics and Business, 76 Patision St, 10434 Athens, Greece
e-mail: jpan@aueb.gr