

Nonparametric CUSUM control chart based on Wilcoxon signed-rank statistics and Hodges Lehmann estimator

ABSTRACT

Nowadays, statistical process control (SPC) is widely used in the industry for measuring and controlling the quality for the manufacturing process. Cumulative sum control chart (CUSUM) is effective in detecting a small shift of a process. By using classical CUSUM, the normality assumption of the data is needed. However, the normality assumption always cannot be reached in real situation. To overcome these problems, the nonparametric statistics is used since the nonparametric statistics does not require normality assumption. Hence, Hodges-Lehmann (HL) estimator and Wilcoxon Signed-Rank (SR) statistics are used to integrate with the CUSUM control chart and formulate nonparametric CUSUM control chart which are HL-CUSUM and SR-CUSUM control chart. Average run length (*ARL*) is used to measure the performance of each CUSUM control chart. Our simulation study showed that the HL-CUSUM perform best in the small skewed data while the SR-CUSUM has the best performance when the skewness of the data increase.

Keyword: CUSUM control chart; Normality; Nonparametric statistics; Average run length; Skewness