



Contribution ID: 87

Type: **not specified**

The Effects of Large Round-Off Errors on the Performance of Control Charts for the Mean

Monday, 11 September 2023 13:30 (20 minutes)

This research discusses the effects of large round-off errors on the performance of control charts for means when a process is normally distributed with a known variance and a fixed sample size. Quality control in practice uses control charts for means as a process monitoring tool, even when the data is significantly rounded. The objective of this research is to demonstrate how ignoring the round-off errors and using a standard Shewhart chart affects the quality control of a measured process.

The first part of the research includes theoretical calculations for estimating the values of alpha, beta, ARL_0 , and ARL_1 , relating to the unrounded data and the large-rounded data. For the rounded data, normality can no longer be assumed because the data is discrete, therefore the multinomial distribution is used. Results show that under the null hypothesis (H_0), alpha and ARL_0 indicate that false alarms are more frequent. Under the alternative hypothesis (H_1), the influence on beta and ARL_1 is minor and inconsistent. For some rounding levels there is a decline in the control chart performances and in others, there is an improvement. In the second part, a simulation study is used to evaluate the performances of the control chart based on a single sample, checking whether the conclusion (reject or fail to reject) for a sample is consistent for rounded and unrounded data. The results of the simulation match the theoretical calculations.

Keywords

Average Run Length (ARL), Control Chart, Control Limits, Large Round-Off, Measurement Error, Round-Off Error

Classification

Mainly methodology

Primary author: BENSON-KARHI, Diamanta (The Open University of Israel)

Presenter: BENSON-KARHI, Diamanta (The Open University of Israel)

Session Classification: CONTRIBUTED Quality 1

Track Classification: Quality