

Title: Likelihood-Based Control Limits for Parts-per-Million Nonconforming Items

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Degree: Master of Science in Statistics

Date: October 2004

Abstract:

The study explores further the power-transformation used in control-charting high precision processes. Charts based on different power-transformations and log-transformation are simulated. Maximum likelihood and method of moments are used to estimate the control limits.

Results show that MLE charts based on smaller exponents have smaller MSE than MME charts. However, the latter have greater power and less bias than the former. Both MLE and MME charts based on smaller exponents have similar power as the log-transformation-based chart. The operating characteristic curve shows that charts based on smaller exponents are more sensitive in detecting worsening quality but less sensitive in detecting improving quality. Similarly, the average run lengths of charts based on smaller exponents indicate faster detection of deteriorating quality but higher false-alarm rate.