

Confidence Intervals for Process Capability Indices for Autocorrelated Data

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Abstract : Persistent pressure passed on to manufacturers from escalating consumer expectations and the ever growing global competitiveness have produced a rapidly increasing interest in the development of various manufacturing strategy models. Academic and industrial circles are taking keen interest in the field of manufacturing strategy. Many manufacturing strategies are currently centered on the traditional concepts of focused manufacturing capabilities such as quality, cost, dependability and innovation. Process capability indices was conducted assuming that the process under study is in statistical control and independent observations are generated over time. However, in practice, it is very common to come across processes which, due to their inherent natures, generate autocorrelated observations. The degree of autocorrelation affects the behavior of patterns on control charts. Even, small levels of autocorrelation between successive observations can have considerable effects on the statistical properties of conventional control charts. When observations are autocorrelated the classical control charts exhibit nonrandom patterns and lack of control. Many authors have considered the effect of autocorrelation on the performance of statistical process control charts. In this paper, the effect of autocorrelation on confidence intervals for different PCIs was included. Stationary Gaussian processes is explained. Effect of autocorrelation on PCIs is described in detail. Confidence intervals for Cp and Cpk are constructed for PCIs when data are both independent and autocorrelated. Confidence intervals for Cp and Cpk are computed. Approximate lower confidence limits for various Cpk are computed assuming AR(1) model for the data. Simulation studies and industrial examples are considered to demonstrate the results.

Keywords : autocorrelation, AR(1) model, Bissell's approximation, confidence intervals, statistical process control, specification limits, stationary Gaussian processes

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