World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:13, No:09, 2019

A Study on the False Alarm Rates of MEWMA and MCUSUM Control Charts When the Parameters Are Estimated

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Abstract : It is now a known fact that quality is an important issue in manufacturing industries. A control chart is an integrated and powerful tool in statistical process control (SPC). The mean μ and standard deviation σ parameters are estimated. In general, the multivariate exponentially weighted moving average (MEWMA) and multivariate cumulative sum (MCUSUM) are used in the detection of small shifts in joint monitoring of several correlated variables; the charts used information from past data which makes them sensitive to small shifts. The aim of the paper is to compare the performance of Shewhart xbar, MEWMA, and MCUSUM control charts in terms of their false rates when parameters are estimated with autocorrelation. A simulation was conducted in R software to generate the average run length (ARL) values of each of the charts. After the analysis, the results show that a comparison of the false alarm rates of the charts shows that MEWMA chart has lower false alarm rates than the MCUSUM chart at various levels of parameter estimated to the number of ARL0 (in control) values. Also noticed was that the sample size has an advert effect on the false alarm of the control charts.

Keywords : average run length, MCUSUM chart, MEWMA chart, false alarm rate, parameter estimation, simulation
Conference Title : ICASA 2019 : International Conference on Applied Statistics and Analysis
Conference Location : Vancouver, Canada
Conference Dates : September 24-25, 2019