

ABSTRACT

Product quality can be explained through a relationship between response variable and explanatory variable which is known as a profile. When the relationship between two variables is linear then it is known as a simple linear profile. Sometimes profile depends upon time and the observations within profile are correlated. Profile parameters are estimated in Phase I profile monitoring and are used in Phase II profile monitoring to construct the control limits. Then small shifts are detected in Phase II profile monitoring which causes the out-of-control situation for any manufacturing process. The profile parameters are monitored through a statistical tool which is known as control chart. EWMA-3 control chart is used to examine the consequences of small shifts in Phase II for intercept, slope and error variance independently. Many researchers have used fixed explanatory variable in linear profile and few of them have used first order autoregressive structure within simple linear profiles using time varying factor. This study considers the case of simple linear profile model when explanatory variable is random and there is auto correlation within profile. We have considered AR (1) structure between error terms which results into correlated observations against each value of explanatory variable. Time varying control limits have constructed due to the non-independent but identically distributed estimators. The performance of proposed scheme has been evaluated through performance measures such as Average Run Length (ARL), Standard Deviation Run Length (SDRL) and Median Run Length (MDRL). This simulation study showed a significant effect of autocorrelation in the performance of proposed charting scheme. Specifically proposed V_x -EWMA-3 control chart performed better as compared to proposed F_x -EWMA-3 control chart particularly for small shifts in Phase II profile monitoring.