

# 표본크기에 제약이 있는 누적-축차관리도

## Cumulative-Sequential Control Charts with Sample Size Upper Bound

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### Abstract

This paper proposes sequential probability ratio test(SPRT) control charts with an upper bound on sample size. Existing SPRT control charts are constructed under the assumption that there is no restriction on the number of observations at every sampling point. For situations where the time(or cost) required to sample and test an item is long(or high), existing SPRT control charts may not be directly applied. When the number of observations in a sampling point reaches the upper bound and there is no evidence of out-of-control state, the proposed cumulative-sequential control chart defers the decision to the next sampling point of which starting value is the value of the current statistic. Two Markov chains, inner and outer chains, are used to derive the formulas for evaluating the performances of the proposed chart such as average run length(ARL), average number of observations(ANOS), and average sample number(ASN). It is compared with  $\bar{X}$  and cumulative sum(CUSUM) charts with fixed and variable sample sizes. To compare the proposed cumulative-SPRT chart with existing SPRT charts, the performances of proposed chart are studied as upper bound on sample size increases. The results show that the proposed cumulative-SPRT chart performs better than  $\bar{X}$  and CUSUM charts, especially when mean shift is small or moderate, and that its performance converges rapidly to that of SPRT control chart as the upper bound increases. The fast initial response(FIR) feature shows that if the process starts in control, FIR feature has little effect; however, if the process mean is not at the desired level, an out-of-control signal will be given faster when the FIR feature is used.