

On ARL-unbiased c-charts for i.i.d. and INAR(1) Poisson counts

In Statistical Process Control (SPC) it is usual to assume that counts have a Poisson distribution. The non-negative, discrete and asymmetrical character of a control statistic with such distribution and the value of its target mean may prevent the quality control practitioner to deal with a c-chart with: a pre-specified in-control average run length (ARL); a positive lower control limit; the ability to control not only increases but also decreases in the mean of those counts in a timely fashion.

Furthermore, as far as we have investigated, the c-charts proposed in the SPC literature tend not to be ARL-unbiased. (The term ARL-unbiased is used here to coin any control chart for which all out-of-control ARL values are smaller than the in-control ARL.)

In this talk, we explore the notions of unbiased, randomized and uniformly most powerful unbiased (UMPU) tests to correct the bias of the ARL function of the c-chart. We use the R statistical software to provide instructive illustrations of: ARL-unbiased c-charts for i.i.d. Poisson counts; quasi ARL-unbiased c-charts for the mean of first-order integer-valued autoregressive (INAR(1)) Poisson counts.