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New CUSUM Charts, the GLR Procedure and the Parabolic Mask

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The cumulative sum (CUSUM) control chart iterates sequential probability ratio tests (SPRT) until the first SPRT ends with rejecting the null hypothesis. Because the latter exhibits some deficiencies if the true mean is substantially different to the one used in the underlying likelihood ratio, Abbas (2023) proposes to substitute the SPRT by a repeated significance test (RST), cf. to Armitage et al. (1969). To fix the latter's missing ability to renewal (core element of the CUSUM chart), Abbas (2023) combines SPRT und RST. The resulting control chart, labelled as "step CUSUM", performs quite well for a wide range of potential shifts in the mean of a normal random variable. However, the older generalized likelihood ratio (GLR) procedure, e. g. Reynolds & Lou (2010), deploys similar alarm thresholds and performs even better. Both are more difficult to analyze than the plain CUSUM chart. Interestingly, the GLR scheme is equivalent to applying a parabolic mask (Wiklund 1997). The GLR procedure experienced quite some up and downs during the last decades, but it should be more used in routine monitoring work. Eventually, some reflections upon the cost-benefit relation are given.

References

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