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EWMA control charts for the correlation coefficient

The exponentially weighted moving average (EWMA) control chart was proposed already in 1959 and it became one of the most popular devices in statistical process monitoring (SPM) in the last decade of the previous century. Besides its most popular version for monitoring the mean of a normal distribution, many other statistical parameters were deployed as target for setting up an EWMA chart. Here, we consider its application for monitoring the correlation coefficient (cc), which was rarely investigated so far. The distribution of the sample cc, known as Pearson (Bravais) cc, has been known since Fisher (1921). However, this distribution is quite complex if the underlying correlation is different to zero. Here, we discuss the calculation of the zero-state average run length (ARL) for various sample sizes. It turns out that depending on the sample size, one uses either well-known procedures like the Gauß-Legendre Nyström procedure for large samples sizes, whereas for smaller ones (< 20), one has to stick to collocation. Moreover, we examine further configuration details and provide some guidelines. An application for monitoring sensor health completes this contribution.

Special/ Invited session

Classification

Mainly methodology

Keywords

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