COMPARISON OF THE CUSCORE, GLRT AND CUSUM CONTROL CHARTS FOR DETECTING A DYNAMIC MEAN CHANGE

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Abstract. Although statistical process control (SPC) techniques have been focused mostly on detecting constant mean shifts, dynamic and time-varying process changes frequently occur in the monitoring of feedback-controlled and autocorrelated processes. In this research, the performances of cumulative score (Cuscore), generalized likelihood ratio test (GLRT), and cumulative sum (CUSUM) charts in detecting a dynamic mean change that finally approaches a steady-state value are compared. Theoretical results in average run length (ARL) comparison are provided. From the theoretical study we find that, when the steady-state value is greater or less than a critical value, $R\delta/2 + \delta/2$, the Cuscore and CUSUM charts have a different performance in detecting the mean change. We prove also that the GLRT has the best performance among the three charts in detecting any mean change for which the steady-state value is not equal to δ or δR, when the in-control ARL is large.

Key words and phrases: Statistical process control, change point detection, average run length.