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Enhancing the Performance of Exponentially Weighted Moving Average Charts: Discussion

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Abbas *et al*. (Abbas N, Riaz M, Does RJMM. Enhancing the performance of EWMA charts. Quality and Reliability Engineering International 2011; 27(6):821–833) proposed the use of signaling schemes with exponentially weighted moving average charts (named as 2/2 and modified − 2/3 schemes) for their improved design structures. A two-sided control structure of these schemes is given in the paper. The computational results in some of the tables of that paper for modified − 2/3 are mistakenly given for the one-sided control structure. The corrected two-sided results are provided here. It is noticed that the superiority of the proposed scheme over the classical exponentially weighted moving average chart remains but is less pronounced. **Copyright © 2014 John Wiley & Sons, Ltd.**

Keywords: average run length (*ARL*); control chart; CUSUM; in-control; out-of-control; runs rules

Abbas *et al.*[1] proposed two signaling schemes to be applied with the control structure of the exponentially weighted moving average chart. These schemes are named as the simple 2/2 scheme and the modified − 2/3 scheme. The plotting statistic for the modified − 2/3 scheme is given in their paper in (2), whereas the two-sided control limits are given in (7). The average run lengths and standard deviation of the run lengths for the modified − 2/3 scheme given in Tables III, V, VII, and IX are mistakenly computed for one-sided upper limits by Abbas *et al.*[1] The reason is being the omitted statement in a simulation code (mistakenly) dealing with the lower sided limit. The corrected versions of these tables are given in the succeeding text, which are computed for the two-sided control limits. From these revised results, we can see that the values of the control limit coefficients (L_s) are revised,

Table III. Average run length values for the proposed Scheme II at $ARL_0 = 168$

δ	$\lambda = 0.1$	$\lambda = 0.25$	$\lambda = 0.5$	$\lambda = 0.75$
	$L_s = 2.158$	$L_s = 2.214$	$L_s = 2.079$	$L_s = 1.873$
0	167.09	167.866	167.425	168.398
0.25	53.71	71.588	89.575	100.892
0.5	19.371	25.573	35.431	43.219
0.75	10.403	12.556	16.605	20.535
1	6.829	7.729	9.428	11.423
1.5	4.013	4.277	4.566	5.053
2	2.963	3.057	3.086	3.184

Table V. Average run length values for the proposed Scheme II at $ARL_0 = 200$

δ	$\lambda = 0.1$	$\lambda = 0.25$	$\lambda = 0.5$	$\lambda = 0.75$
	$L_s = 2.236$	$L_s = 2.276$	$L_s = 2.134$	$L_s = 1.921$
0	201.442	199.180	200.759	199.665
0.25	60.891	81.004	105.348	117.877
0.5	20.883	28.031	39.616	48.898
0.75	11.042	13.346	18.008	22.739
1	7.188	8.089	10.108	12.338
1.5	4.161	4.408	4.759	5.289
2	3.043	3.127	3.160	3.264

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Table VII. Average run length values for the proposed scheme II at $\boldsymbol{ARL_0} = 500$

δ	$\lambda = 0.1$ $L_s = 2.579$	$\lambda = 0.25$ $L_s = 2.581$	$\lambda = 0.5$ $L_s = 2.398$	$\lambda = 0.75$ $L_s = 2.163$
0	500.494	501.463	500.168	501.088
0.25	102.588	161.806	227.591	263.445
0.5	29.163	44.691	72.144	95.725
0.75	14.214	18.744	28.661	39.297
1	8.877	10.415	14.242	19.096
1.5	4.889	5.174	5.84	6.91
2	3.438	3.513	3.578	3.821

Table IX. Standard deviation of the run length values for the proposed scheme II at $\boldsymbol{ARL_0} = 500$

δ	$\lambda = 0.1$ $L_s = 2.579$	$\lambda = 0.25$ $L_s = 2.581$	$\lambda = 0.5$ $L_s = 2.398$	$\lambda = 0.75$ $L_s = 2.163$
0	501.462	500.143	499.284	499.8
0.25	95.62	158.02	225.824	261.006
0.5	22.427	40.308	69.589	93.98
0.75	9.218	14.849	26.11	37.208
1	5.046	7.039	11.708	17.142
1.5	2.253	2.585	3.688	5.118
2	1.289	1.373	1.64	2.137

ARL, average run length.

and the superiority of the modified − 2/3 scheme is still there (as established in the paper) against all the competitors discussed in Section 5 by Abbas *et al.*[1] However, the strength of superiority is substantially lower in case of the revised results. In addition to these rules, we suggest the use of more refined rules of Riaz *et al.*[2] and Mehmood *et al.*[3] because of the independent capacity of each rule.

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