Short note explaining the error in 'Machado M.A.G. and Costa A.F.B. (2014) "A side-sensitive synthetic chart combined with an *X* chart." *International Journal of Production Research* 52 (11): 3404–3416'

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We recently read the above mentioned exceptional paper, where the authors proposed a side-sensitive synthetic chart combined with an $\bar{X}$ chart. We would like to point out that the expression for the steady-state initial probability vector, given in the Appendix, seems to be slightly incorrect. That is, Machado and Costa (2014) stated that the initial probability vector (i.e. $\mathbf{S}' = (s_1, s_2, \ldots, s_L, s_{L+1}, s_{L+2}, \ldots, s_{2L}, s_{2L+1})$ is given by

$$\mathbf{S} = \frac{1}{D}\mathbf{S}_C \tag{1}$$

with

$$\begin{aligned} D &= 2\sum_{i=0}^{L-1} C^i + 2C^L(1-A)^{-1}, \\ \mathbf{S}'_C &= \left(C^{L-1}, C^{L-2}, \ldots, C^0, 2C^L(1-A)^{-1}, C^0, \ldots, C^{L-2}, C^{L-1}\right), \text{ and} \\ C &= \tfrac{2A}{1+A}. \end{aligned} \tag{2}$$

Our derivation indicates that the steady-state initial probability vector is given by Equation (1), however, with

$$\begin{aligned} D &= 2\sum_{i=0}^{L-1} c_1^i + 2c_1^L(1-c_3)^{-1}, \\ \mathbf{S}'_C &= \left(c_1^{L-1}, c_1^{L-2}, \ldots, c_1^0, 2c_1^L(1-c_3)^{-1}, c_1^0, \ldots, c_1^{L-2}, c_1^{L-1}\right), \\ c_1 &= \tfrac{A}{A+B} \text{ and } c_3 = \tfrac{A}{A+2B}. \end{aligned} \tag{3}$$

Note though, the corresponding values given in Machado and Costa (2014) are correct as the authors used Monte Carlo simulations to evaluate the empirical performance of the schemes considered in their paper.

Thank you for your attention.

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Reference

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