Comments on “Vendor managed inventory with consignment stock agreement for a supply chain with defective items”

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ABSTRACT

The purpose of these comments is to serve as a revision to the article by Khan et al. (2016) [Khan, M., Jaber, M.Y., Zanoni, S., & Zavanella, L. (2016). Vendor managed inventory with consignment stock agreement for a supply chain with defective items. Applied Mathematical Modelling, 40(15–16), 7102–7114.]. This commenting paper suggests that the expected total cost function derived in Khan et al. (2016) was incorrect, and then offers revisions to complement the shortcomings.

Khan et al. (2016) proposed the expected total cost in Eq. (7), which was derived from the total cost in their article. This commenting paper serves to examine a query in the article that may need to be re-examined.

Eq. (7) of their article is as follows,

\[ E[TC] = A_v + \lambda A_b + d\lambda q + \frac{\lambda h_v q^2}{2p} + (h^*_b + h^*_v)q^2 \]

\[ \times [\lambda (\frac{D}{2p^2} + \frac{E[\gamma]}{x}) + \frac{1}{2}(1 - E[\gamma] - \frac{D}{p})\left(\frac{\lambda (\lambda + 1)}{p} + \lambda^2 \left(\frac{1 - E[\gamma]}{D} - \frac{1}{p}\right)\right)]. \] (1)

This equation was derived from the total cost (before Eq. (7)) as follows

\[ TC = A_v + \lambda A_b + d\lambda q + \frac{\lambda h_v q^2}{2p} + (h^*_b + h^*_v)q^2 \]

\[ \times [\lambda (\frac{D}{2p^2} + \frac{E[\gamma]}{x}) + \frac{1}{2}(1 - \gamma - \frac{D}{p})\left(\frac{\lambda (\lambda + 1)}{p} + \lambda^2 \left(\frac{1 - \gamma}{D} - \frac{1}{p}\right)\right)]. \] (2)
However, upon further inspection one can see an error in the last part of Eq. (2),
$$\frac{1}{2}(1 - \gamma - \frac{D}{P})\left\{ \frac{\lambda(\lambda + 1)}{P} + \lambda^2 \left( \frac{1 - \gamma - \frac{1}{P}}{D} \right) \right\}.$$ This expands to a term of $\gamma^2$. $E[\gamma^2]$ will be in the expected total cost $E[TC]$. Since, $E[\gamma^2] \neq (E[\gamma])^2$ (Bain & Engelhardt (1991), pp.78-70), this shows that Eq. (1) is incorrect.

The correct equation should be rewritten as follows,

$$E[TC] = A_v + \lambda A_b + d\lambda q + \frac{\lambda h_v q^2}{2P} + (h^*_b + h'_b)q^2 \lambda \left( \frac{D}{2P^2} + \frac{E[\gamma]}{x} \right)$$
$$+ (h^*_b + h'_b)q^2 \left( \frac{1 - E[\gamma]}{D} - \frac{D}{P} \right) \frac{\lambda(\lambda + 1)}{P}$$
$$+ (h^*_b + h'_b)q^2 \left( \frac{1 - 2E[\gamma] + E[\gamma^2]}{D} + \frac{-2 + 2E[\gamma] + \frac{D}{P}}{P} \right).$$

References
