

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

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CHRONICLE

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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., Zaroni, 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.

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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,

$$E[TC] = A_v + \lambda A_b + d\lambda q + \frac{\lambda h_v q^2}{2p} + (h_b'' + h_v')q^2 \quad (1)$$

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

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

$$TC = A_v + \lambda A_b + d\lambda q + \frac{\lambda h_v q^2}{2p} + (h_b'' + h_v')q^2 \quad (2)$$

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

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However, upon further inspection one can see an error in the last part of Eq. (2), $\frac{1}{2}(1-\gamma-\frac{D}{P})\{\frac{\lambda(\lambda+1)}{P}+\lambda^2(\frac{1-\gamma}{D}-\frac{1}{P})\}$. This expands to a term of $\gamma^2 \cdot E[\gamma^2]$ 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,

$$\begin{aligned}
 E[TC] = & A_v + \lambda A_b + d\lambda q + \frac{\lambda h_v q^2}{2p} + (h_b'' + h_v')q^2 \lambda \left(\frac{D}{2P^2} + \frac{E[\gamma]}{x} \right) \\
 & + (h_b'' + h_v')q^2 \frac{1}{2} \left(1 - E[\gamma] - \frac{D}{P} \right) \left\{ \frac{\lambda(\lambda+1)}{P} \right\} \\
 & + (h_b'' + h_v')q^2 \frac{\lambda^2}{2} \left(\frac{1 - 2E[\gamma] + E[\gamma^2]}{D} + \frac{-2 + 2E[\gamma] + \frac{D}{P}}{P} \right).
 \end{aligned} \tag{3}$$

References

- Bain, L. J., & Engelhardt, M. (1991). *Introduction to probability and mathematical statistics*. Belmont California: 2nd edition, An imprint of Wadsworth publishing company.
- Khan, M., Jaber, M.Y., Zaroni, 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.