Study on the optimal inventory model

Based on the analysis of the derivation of the model, the relevant cost for both buyers may change as follows:

When the seller doesn't provide the quantity discount in the first cycle, the buyer has to seek the optimal order cycle T^* to minimize the relevant cost per unit time. The relevant cost for both buyers is respectively:

$\frac{B(P,T^*)}{T^*}$ (The relevant cost in the smallest unit of time of the buyer in the order cycle T^*)

$\frac{S(P,T^*)}{T^*}$ (The relevant cost in the smallest unit of time of the seller in the order cycle T^*)

The minimum joint cost for both buyers is obtained in the order cycle T^{**}. The relevant cost for both buyers is respectively:

$\frac{B(p_1,T^{**})}{T^{**}}$ (The relevant cost per unit time of the buyer in the order cycle T^{**})

$\frac{S(p_1,T^{**})}{T^{**}}$ (The relevant cost per unit time of the buyer in the order cycle T^{**})

$T^{**} \succ T^*$, so if the seller doesn't provide the quantity discount in the situation that the buyer and the seller unite, namely $p_i = P$,the relevant cost of the buyer per unit time is: $\frac{B(P,T^{**})}{T^{**}} > \frac{B(P,T^*)}{T^*}$,which means the relevant cost increases in the situation that the buyer unites and the intention of the buyer is influenced. If the seller provides the quantity discount to encourage the buyer in the situation that the buyer and the seller unite, the relevant cost of the seller per unit time is: $\frac{S(p_1,T^{**})}{T^{**}} > \frac{S(P,T^*)}{T^*}$, which means the relevant cost increases in the situation that the seller provides quantity discount and the joint intention of the seller is also influenced.

Based on the analysis above, in order to make the buyer and the seller unite and minimize the joint cost for both buyers, we must seek the best discount price p_1^* that replaces p_1 and the optimal order cycle T^{***} that replaces T^{**},meeting the condition that $\frac{B(p_1^*,T^{***})}{T^{***}} \le \frac{B(P,T^*)}{T^*}$ and $\frac{S(p_1^*,T^{***})}{T^{***}} \le \frac{S(P,T^*)}{T^*}$. p_1^* and T^{***} are proved to be existed ,and this paper will not demonstrate in detail.

Conclusion

Through the analysis of inventory model via the derivation, under the situation that the buyer and the seller unite, and according to the model this research provides, we get the optimal order cycle and the optimal quantity discount to achieve the win-win goal of minimizing the joint cost and saving the relevant cost for both buyers.

References

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