

Coordination of Production/ Order Policy for a Single Vendor Single Buyer chain with stochastic demand

D. Jafari; S.M. Moattar Husseini; M.H. Fazel Zarandi

ABSTRACT

Coordination is an important function in supply chain management (SCM) to provide better competitive capability of the chain. Coordination through vendor-buyer negotiation is an area which has received great research attention in particular in modern systems. In this study, a number of methods, including those based on price discount and cost minimization models have been suggested in the literature. Mathematical models developed to determine economic order/production lot size for a "single vendor single buyer" stochastic demand situation are proposed. These models consider both independent and joint decisions for chain member. Through considering price discounts it is suggested a vendor buyer coordination mechanism to reach the most appropriate decision. For this, a solution algorithm has been detailed in the paper. Numerical study is also provided to illustrate the effectiveness of the proposed method.

KEYWORDS

Supply Chain, Coordination, Single Vendor/Single Buyer, Production-Order, Stochastic Demand, Discount Mechanism.

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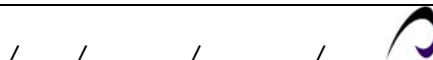
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$$h_b = I * C$$

/ :I
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() :A_v
:A_b
:SS
:L
:X

σ_L μ_L
: f_X(x)

:r
:π
:TC_b
:C(ss)
:TC_v
:TCC

A_b = q

$$A_b \frac{D}{q} \quad ()$$

$$\left(\frac{q}{2} + SS \right) \quad () \quad (r, Q)$$

$$r = \mu_L + Z_\alpha \cdot \sigma_L$$

$$SS = r - \mu_L \Rightarrow SS = Z_\alpha \sigma_L$$

$$h_b \left(\frac{q}{2} + SS \right) \quad () \quad :Q$$

$$\bar{b}_{(r)} = E(X - r)^+ \quad () \quad () \quad :n$$

$$E(X - r)^+ = \int_r^\infty (x - r) f_X(x) dx \quad () \quad :q$$

:P

:D

$$\bar{b}_{(r)} = \sigma_L G_u(k) \quad () \quad :h_v$$

:h_b



$$TC_v = \frac{D}{nq} A_v + h_v \left(\left[\frac{nq}{2P} (P-D) + \frac{Dq}{P} \right] - \left(\frac{q}{2} + SS \right) \right) \quad ()$$

$$n \quad Q=nq$$

$$n = \left(\sqrt{\frac{DA_v}{\frac{h_v q^2}{2} \left(1 - \frac{D}{P}\right)}} \right) \quad ()$$

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$$TCC(n, q) = \frac{D}{nq} A_v + \frac{D}{q} [A_b + \pi \bar{b}(r)] \quad ()$$

$$+ h_v \left[\left(\frac{nq}{2P} (P-D) + \frac{Dq}{P} \right) - \frac{q}{2} \right] + h_b \left(\frac{q}{2} + SS \right)$$

$$TCC(n, q) = \frac{D}{nq} [A_v + nA_b + n\pi \bar{b}(r)] + \quad ()$$

$$h_v \left(\frac{nq}{2P} (P-D) + \frac{Dq}{P} \right) + [h_b - h_v] \frac{q}{2} + h_b * SS$$

$$q^* = \sqrt{\frac{[A_v + nA_b + n\pi \bar{b}(r)] D}{n \left[h_v \left(\frac{D}{P} + \frac{(P-D)n}{2P} \right) \right] + \frac{\Delta h}{2}}} \quad ()$$

$$\Delta h = h_b - h_v \quad ()$$

$$n^* = \sqrt{\frac{DA_v}{\frac{h_v q^2}{2} \left(1 - \frac{D}{P}\right)}} \quad ()$$

$$K = \frac{r - \mu_L}{\sigma_L} \quad G_u(k) = \int_k^\infty (u_0 - K) \frac{1}{\sqrt{2\pi}} e^{-\frac{u_0^2}{2}} du_0$$

$$\pi \bar{b}(r) \frac{D}{q} \quad ()$$

$$TC_b = \frac{D}{q} [A_b + \pi \bar{b}(R)] + h_2 \left(\frac{q}{2} + SS \right) \quad ()$$

$$C(SS) = h_2(r - \mu_L) + \pi \frac{D}{q} \int_r^\infty (x - r) f_D(d) dx \quad ()$$

$$q^* = \sqrt{\frac{2D(A_b + \pi \bar{b}(r))}{h_b}} \quad ()$$

$$F(r) = \frac{\pi D - h_b q}{\pi D} \quad ()$$

$$F(r) = p(Z \leq K) = 1 - \alpha \quad ()$$

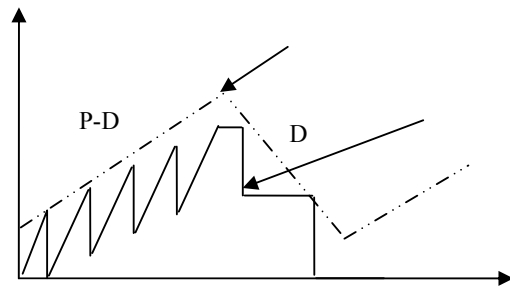
A_v :

$$\frac{D}{nq} \quad ()$$

$$\left[\frac{nq}{2P} (P-D) + \frac{Dq}{P} \right] + SS \quad ()$$

$$\left(\left[\frac{nq}{2P} (P-D) + \frac{Dq}{P} \right] + SS - \left(\frac{q}{2} + SS \right) \right) \quad ()$$

$$h_v \left(\left[\frac{nq}{2P} (P-D) + \frac{Dq}{P} \right] - \frac{q}{2} \right) \quad ()$$



$$q \bar{b}(r)$$

$$n \binom{\cdot}{\cdot} \quad q$$

$$(Q=nq)$$

$$n$$

$$\binom{[n]}{[n]} \quad \binom{[n]}{n} \quad (\quad) \quad [\quad]$$

$$(\quad) \quad (\quad)$$

$$(\quad) (\quad)$$

$$q^*, n^*$$

$$(\quad) \quad n^0 = 1 (\quad) \quad [\quad] [\quad]$$

$$(\quad) \quad n^i \quad q^i \quad (\quad) \quad q^0$$

$$TCC(n^{i-1}, q^{i-1}) \leq TCC(n^i, q^i)$$

$$TCC(n^{i-1}, q^{i-1}) \leq TCC(n^{i-2}, q^{i-2})$$

$$n^* = n^{i-1} \quad q^* = q^{i-1} \quad (\quad) \quad q \quad \bar{b}(r) = 0($$

$$n \quad n^{i+1} = n^i + 1 (\quad) \quad (\quad) \quad q \quad ($$

$$q^{i+1} \quad (\quad) \quad \bar{b}(r) \quad r \quad F(r)$$

$$(\quad) \quad q \quad \bar{b}(r) \quad ($$

$$r \quad q$$

$$q \quad r$$



≤ 0

$$D - d_k C + \left[\frac{D}{q_j} (A_b + \pi \bar{b}_{(r)}) + \frac{1}{2} I - d_k C q_j \right] - \quad ()$$

$$D - C - \left[\frac{D}{q_b} (A_b + \pi \bar{b}_{(r)}) + \frac{1}{2} I - C q_b \right] \leq 0 \quad ()$$

$(1 - d_k)$

$()$

d_k

$$d_k^{\max} = \left[\frac{\left(\frac{D}{q_b} - \frac{D}{q_j} \right) (A_b + \pi \bar{b}_{(r)}) + \frac{1}{2} I C q_b + DC}{\frac{1}{2} I C q_j + DC} \right] \quad ()$$

$C^{\max} = d_k^{\max} \cdot C$

$$(1 - d_k^{\max}) = (1 - d_k)_{\min} = \left[\frac{\frac{1}{2} I C (q_j - q_b) - \left(\frac{D}{q_b} - \frac{D}{q_j} \right) (A_b + \pi \bar{b}_{(r)})}{\frac{1}{2} I C q_j + DC} \right] \quad ()$$

$()$

$$= \left[\left(\begin{array}{c} \vdots \\ \vdots \\ \vdots \end{array} \right) \right]$$

$$= D$$

$$= P$$

$$= A_v \left\{ \begin{array}{c} \vdots \\ \vdots \\ \vdots \end{array} \right\} \left\{ \begin{array}{c} \vdots \\ \vdots \\ \vdots \end{array} \right\} \geq 0$$

$$= A_b$$

$$= h_b$$

$$= h_v$$

$$= \pi \left(D d_k C - \frac{D}{n q_j} A_v - h_v \left[\left(\frac{n_j q_j}{2p} (p-D) + \frac{D q_j}{p} \right) - \left(\frac{q_j}{2} + SS \right) \right] \right) \geq 0 \quad ()$$

$$= \pi \left(D C - \frac{D}{n q_b} A_v - h_v \left[\left(\frac{n_b q_b}{2p} (p-D) + \frac{D q_b}{p} \right) - \left(\frac{q_b}{2} + SS \right) \right] \right) \geq 0 \quad ()$$

$$: X$$

$$:$$

$$d_k^{\min} = \frac{DC + TC_v^{q_j} - TC_v^{q_b}}{DC} \quad ()$$

$$\% = I$$

$$= C$$

$$: TC_v^{q_j}$$

$$: TC_v^{q_b}$$

$$q_j, q_b \quad ()$$

$$() \quad ()$$

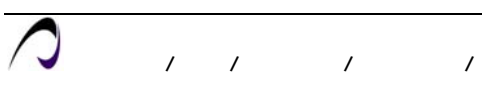
$$()$$

$$C_{\min} = d_k^{\min} \cdot C \quad ()$$

$$()$$

$$(1 - d_k)_{\max} = \frac{TC_v^{q_b} - TC_v^{q_j}}{DC} \quad ()$$

$$C_{\min} \leq C_{\max}$$



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				q_b	q_j	n_b	n_j	$\bar{b}_{(r)}$		
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- Supply Chain Management
 - Supplier
 - Distribution Center
 - Buyer-Vendor coordination
 - production-Distribution coordination
 - Inventory-Distribution coordination
 - Noncooperative and cooperative Game
 - Lead Time
 - Holonic Manufacturing System
 - Agent-based System

