Table 2. Symbols of modeling

i	Index set of retailers, traditional retailer ($i = 1$), e-tailer ($i = 2$), OCR ($i = 3$).
Cost parameters	
Pm	Wholesaler price.
k	Channel integration cost of OCR.
c_0, c_1	Delivery time dependent cost parameters of the e-tailer.
c_2, c_3	Related cost of delivery time parameters of the OCR.
c'	Average distribution cost for each product unit which is delivered from the store of OCR.
k'	Channel integration and average distribution cost for each product unit which is delivered from the store of OCR.
h	Cost of holding a unit of inventory in channel i.
s	Cost of stock-out a unit of an unmet inventory in channel i.
Demand parameters	
y_i	Deterministic demand of traditional retailer, e-tailer, and OCR, respectively ($\forall i = 1,2,3,$).
n	Index of consumer's channel preferences towards OSDH service ($n \in [0,1]$).
α_i	Number of consumers who prefer the traditional retailer, e-tailer, and OCR, respectively ($\forall i = 1,2,3$).
α_{OSDH}	Number of consumers who prefer the OSDH services.
sensitivity parameters	
β	Price sensitivity in traditional retailer, e-tailer, and OCR, respectively.
θ	Return sensitivity in e-tailer
γ_i	Delivery time sensitivity in e-tailer, and OCR, respectively ($\forall i = 2,3$).
δ_1	Consumers (%) that are transferred between the traditional retailer and e-tailer due to the price differences between P_1 and P_2 .
δ_2	Consumers (%) that are transferred between the traditional retailer and OCR due to the price differences between P_1 and P_3.
δ_3	Consumers (%) that are transferred between the e-tailer and OCR due to the price differences between P_2 and P_3.
τ_1	Consumers (%) switching from online sales channels (either for e-tailer or OCR) to the offline sales channel (either for traditional retailer or OCR) due to the delivery time indicator.
τ_2	Consumers (%) switching from online sales channels (either for e-tailer or OCR) to the offline sales channel (either for traditional retailer or OCR) due to the delivery time indicator.
R	Returned quantity for e-tailer.
φ	Refund price sensitivity for return quantity or dependent return parameter for refund price
ϕ	Return quantity independent of refund factor or independent return parameter for refund price
Decision variables	
P_i	Sale price for channel i ($\forall i = 1,2,3$).
l_i	Delivery time for channel i ($\forall i = 2,3$).
r	Refund price for e-tailer.

Demand functions:

$$y_1(P_1) = \alpha_1 - \beta P_1 + \frac{\tau_1}{2}(\gamma_2 l_2) + \delta_1(P_2 - P_1) + \delta_2(P_3 - P_1) \quad (1)$$

$$y_2(P_2, r, l_2) = \alpha_2 - \beta P_2 - \gamma_2 l_2 + \tau_2(l_3 - l_2) - \delta_1(P_2 - P_1) + \delta_3(P_3 - P_2) + \theta r \quad (2)$$

$$y_3(P_3, l_3) = \alpha_3 - \beta P_3 - \gamma_3 l_3 + \frac{\tau_1}{2}(\gamma_2 l_2) - \tau_2(l_3 - l_2) - \delta_2(P_3 - P_1) - \delta_3(P_3 - P_2) \quad (3)$$

Return function:

$$R = \phi + \varphi r \quad (5)$$

Profit functions:

$$\boldsymbol{MAX\ \pi = \sum_{i=1}^{3}(P_i - Pm)y_i - R(r - Pm) - (c_0 - c_1 l_2)^2 - (c_2 - c_3 l_3)^2 - k'}$$

$$= (P_1 - Pm)y_1 + [(P_2 - Pm)y_2 - R(r - Pm) - (c_0 - c_1 l_2)^2] + [(P_3 - Pm)y_3 - (c_2 - c_3 l_3)^2 - k'] \quad (15)$$

Subject to:

$$\boldsymbol{r \le P_2 \le P_1} \quad (16)$$

$$\boldsymbol{P_3 \le P_1} \quad (17)$$

$$\boldsymbol{r, P_1, P_2, P_3, q_1, q_2, q_3, l_2, l_3 \ge 0} \quad (18)$$