Abstract

Facing the increasingly volatile business environments, many companies employ different strategies to achieve competitive edges. One of the key strategies in recent is the timing of the payment for ordering cost. There are three different basic policies for paying the ordering cost: (i) payment at the time of delivery, (ii) postponed payment or credit payment, and (iii) advance payment. Although the influences of delayed payment on inventory policies have attracted great attention, the advance payment and its influences on inventory decisions are rarely addressed. Thus, in this paper, we focus on advance payment (AP) policy in which a seller is powerful and wants to control the risk of the cash flow and he would like the buyer to pay in a fixed period before the date of delivery. Especially, partial advance payment is used to control the risk of buyer’s cancelling order or to finance the procurement of material or parts used in production of the ordered product. This paper therefore constructs an inventory model from the retailer’s perspective under a supply chain system with a partial advance payment and carbon emissions. Five practical orientations are incorporated into the proposed model: (1) the opportunity costs due to making advance payments; (2) the interest charge caused by the bank loans; (3) the carbon emission costs resulting from the deliveries; (4) the quantity discounts offered by suppliers to induce the retailer to order greater quantities; and (5) employing the lot-splitting delivery policy to help prevent there being insufficient retailer storage space or reduce storage costs. The objective of this study is to determine the number of shipment and the inventory lot size corresponding to unit-purchasing cost minimizing the annual total cost. We then demonstrate how the constructed model is a convex function and also derive property to help develop a two-stage solution procedure. An efficient algorithm has been developed to help managers make decisions quickly. Numerical results in general verify the validities of the proposed model and algorithm and show that: (1) the lowest unit purchasing cost in the cost discount schedule may not guarantee that the retailer could obtain minimum annual total cost because the extra quantity purchased may add additional holding cost and thus add the annual total cost; (2) the length of the advance payment, the quantity discounts, and the cost of carbon emissions do impact the retailer’s inventory policy; and (3) in general, the more carbon emission cost is, the larger ordering quantity is and the less number of shipment is. Managerial implications are also explored.

Key Words: Supply chain, Carbon emission, Advance payment