

If  $I_t^n > 0$ , then  $I_t^p = I_t^n$  and  $I_t^f = 0$ . From  $I_t^n < 0$  it follows that  $I_t^f = -I_t^n$  and  $I_t^p = 0$ . Note that at a given point in time only one of both inventory types can be greater than zero. However, their averages taken over time are usually both positive.

- *Inventory position:*  $I_t^d$

The inventory position at the end of period  $t$ ,  $I_t^d$ , is the sum of the net inventory  $I_t^n$  and the inventory on order  $I_t^o$ :

$$I_t^d = I_t^n + I_t^o = I_t^p - I_t^f + I_t^o \quad (\text{B.3})$$

Table B.1 illustrates the relationship between the different types of inventory. In the considered situation, a replenishment order  $q = 400$  is placed whenever the inventory position at the end of a period has reached the reorder point  $s = 236$ . The table exhibits that at the end of period 1 an order with size  $q = 400$  is released which arrives after a replenishment lead time of  $\ell = 5$ , i. e. at the end of period 6. After the stock on hand has been increased at the beginning of period 7, first all outstanding backorders (the backlog) are delivered and only after that the actual demand is served.

If the order quantity is small compared to the demand during the replenishment lead time, it may become necessary to place additional orders while not all outstanding orders have arrived yet. This is shown in Table B.2, where  $q = 200$ . Here, the inventory position at the end of period 4 has already fallen below the reorder point while the last replenishment order is still under way. Thus, an additional order is triggered which increases the inventory on order from 200 to 400.

Period $t$	0	1	2	3	4	5	6	7	8
Demand $d_t$	–	59	54	50	83	44	57	46	54
Inventory on Hand $I_t^p$	248	189	135	85	2	0	0	255	201
Inventory on Order $I_t^o$	–	0	400	400	400	400	400	0	0
Backlog $I_t^f$	–	0	0	0	0	42	99	0	0
Net Inventory $I_t^n$	248	189	135	85	2	-42	-99	255	201
Inventory Position $I_t^d$	248	189	535	485	402	358	301	255	201

Table B.1: Development of Inventory (Order Quantity = 400)