Activity: Wagner-Whitin on six periods

Chapter 5, Dynamic Lot Sizing

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Work in pairs. 25 minutes.

Names: _____

The item. The mower deck belt's first six months, planned as a horizon of their own, but with the ordering cost the distributor now pays for an expedited inbound truck: $k = \$500$ an order. The belt still costs \$50, and the carrying charge is 2% a month, so $h = \$1.00$ per belt per month. The plan starts and ends empty, and carrying is charged on the ending balance.

t	1	2	3	4	5	6
d_t	40	60	120	300	420	260

Notation. The window cost is $w(t,u) = k + h\sum_{s=t}^{u}(s-t)d_s$, the cost of one order in period t covering periods t through u. The recursion is $V(u) = \min_{1\le t\le u}\{V(t-1) + w(t,u)\}$ with $V(0) = 0$, and $S(u)$ is the t that attains the minimum.

Part A. Predict

How many orders will the optimal plan place in six months? Give a reason, from the economic order quantity on the average requirement or from anything else.

Part B. The window costs

Fill the upper triangle, one row at a time from its diagonal outward: each step along row t adds $h(u+1-t)d_{u+1}$.

$w(t,u)$	$u=1$	$u=2$	$u=3$	$u=4$	$u=5$	$u=6$
$t=1$						
$t=2$						
$t=3$						
$t=4$						
$t=5$						
$t=6$						

Part C. The recursion, one column at a time

u	Candidates $V(t-1)+w(t,u)$, for $t=1,\ldots,u$	$V(u)$	$S(u)$
1			
2			
3			
4			
5			
6			

Part D. Trace back, and check

1. Trace the plan back from $S(6)$. Give each order's period and quantity.
2. Cost the plan from scratch, order by order, and confirm it equals $V(6)$.
3. $S(5)$ names a period. Does the optimal plan order there? Why not?

Part E, if you have time. How far can k move?

1. Does any month force an order at $k = \$500$? Would any at the chapter's $k = \$300$?
2. Compare the optimal plan with its two neighbors: the plan that also orders in month 6, and the plan that drops the order in month 5. Over what range of k is your plan cheaper than both?

Exit ticket (tear off and hand in)

Name: _____

1. Why can every window cost be computed before the search begins?

2. True or false, and why: the optimal plan orders in every period $S(u)$ names.