Activity: drawing one cycle

Chapter 3, Deterministic Lot Sizing

Manuel D. Rossetti

Work in pairs. 20 minutes.

Names: _____

The item. The turf-equipment plant stamps a mower deck bracket on its own press. Assembly uses **200** brackets a year, and while the press runs it makes them at **600** a year. Each run makes **300** brackets, and the plant lets up to **40** brackets be owed to assembly before a run starts. Starting a run costs **\$150**, holding a bracket costs **\$6** a year, and owing one costs **\$30** a year. There is no charge per bracket short ($\pi = 0$).

Notation. λ is the demand rate and p the production rate, in brackets per year. Q is the run size and $\hat{B}$ the most owed; $\hat{I}$ is the peak on hand. T_1 to T_4 are the four segments of the cycle, in order: the backorders are cleared, the stock is built, the stock is used up, the backorders build. T_p is the time the press runs. $\bar{I}$ and $\bar{B}$ are the average on hand and the average owed, and k, h and b are the three costs.

$$\bar{I} = \frac{\hat{I}^2}{2Q\left(1 - \frac{\lambda}{p}\right)}, \qquad \bar{B} = \frac{\hat{B}^2}{2Q\left(1 - \frac{\lambda}{p}\right)}$$

Part A. Predict

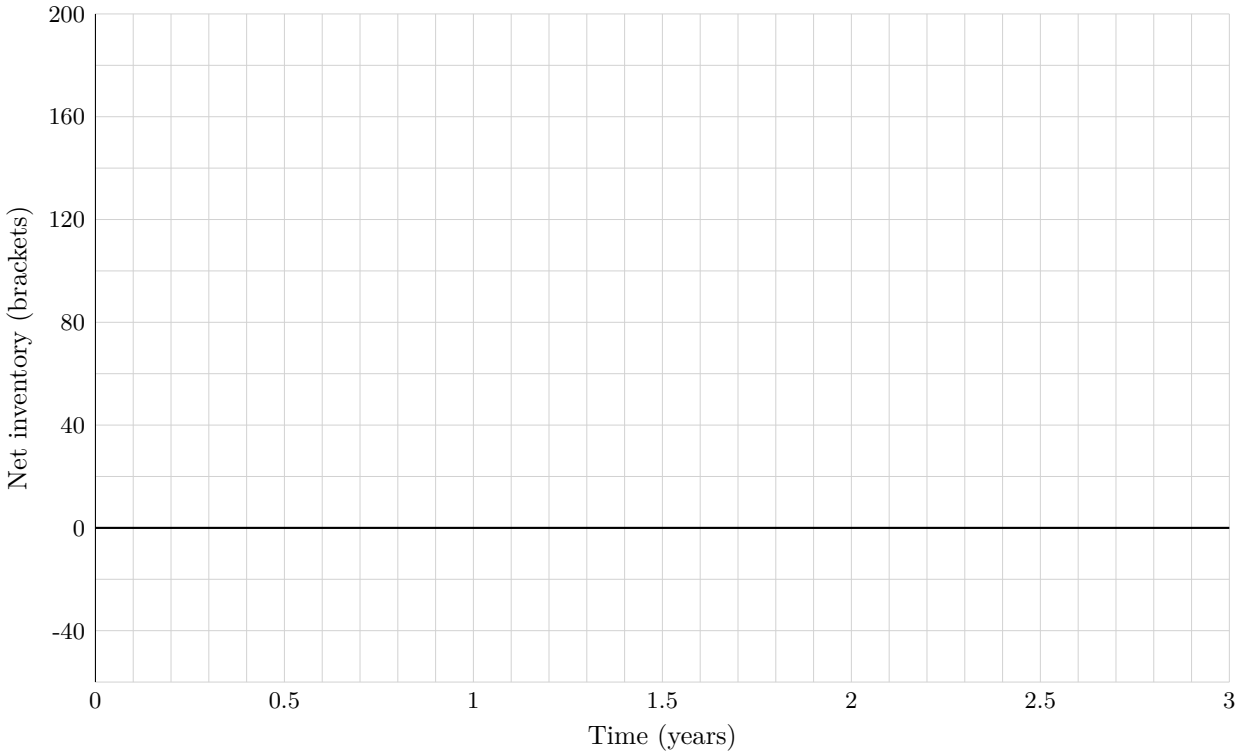
Before computing anything: a classmate says the peak on hand is $Q - \hat{B} = 300 - 40 = 260$ brackets. Is that too high, too low, or right? Why?

Part B. The cycle by its rates

1. Compute T_p, $\hat{I}$, and the four segment lengths, in years.
2. Check: what must the four segments sum to? Does yours?
3. How many months does the press run in each cycle, and for how many months is assembly owed brackets? Show the conversion.

Part C. Draw it to scale

Start at time 0, when a run begins and 40 brackets are owed. Draw two full cycles of net inventory on the grid. Label the four segments, and write each line's slope beside it, in brackets per year.



Part D. The averages and the cost

1. Compute $\bar{I}$ and $\bar{B}$ from the triangles on your drawing: each average is a triangle's area divided by the cycle length.
2. Check both against the formulas at the top of the sheet.
3. Compute the cost rate, $k\lambda/Q + h\bar{I} + b\bar{B}$, in dollars a year, and say which of the three terms is largest.

Part E, if you have time. Switching things off

1. The plant buys a press so fast that a run is effectively instantaneous. Sketch the new cycle with a dashed line on your grid. What are $\hat{I}$, $\bar{I}$ and $\bar{B}$ now? Was your classmate right after all?
2. Back to the 600-a-year press, but assembly may never be owed a bracket. What are $\hat{I}$ and $\bar{I}$?
3. Which two settings together give the sawtooth of the classical economic order quantity?

Exit ticket (tear off and hand in)

Name: _____

1. In one sentence: what does the factor $(1 - \lambda/p)$ measure?

2. Why does a model forbid backorders by letting $b \to \infty$ and not by setting $b = 0$?