Problem: PH company is a bicycles manufacturer, and it produces two types of products: street and road bicycles. The final products can be produced by two types of line : 1 and 2. There are 3 time periods. Below is produce costs for line 1 and line 2 and resource requirement per unit:



To meet customer demands in time in the US, planning department conducted a demand forecasting and counted current initial inventory.



Besides, the information about available capacity(hours) and holding costs per bike are below:



Help planning department to determine the aggregate production plan that minimizes the cost of meeting customer’s demands.

Model:

Parameters:

$T\_{t}$: *horizon length, in periods,* $t\in (1,2,3)$

$N\_{i}$: *Number of products,* $i\in (1,2)$

$K\_{k}$: *Number of resource types,* $k\in (1,2)$

$D\_{it}$: *forecasted number of units demanded for product i in period t*

$m\_{i}$: *number of different line available to make product i*

$A\_{kt}$: *amount of resource k available in period t*

$a\_{ijk}$: *amount of resources k required by one unit of product i if produced by line j*

$C\_{ijt}$: *cost to produce one unit of product i using line j in period t*

$C\_{it}$: *cost to hold one unit of product i in inventory for period*

Calculation variables:

$I\_{it }$:*Number of units of product i held in inventory at the end of period t*

$$I\_{it}=I\_{it-1}+ \sum\_{j=1}^{m\_{i}}P\_{ijt} - D\_{it}$$

Decisions:

$P\_{ijt }$:*Number of units of product i produced by line j in period t*

Objective: *Minimize total cost*

$$min\sum\_{t=1}^{T}\sum\_{i=1}^{N}\sum\_{j=1}^{m\_{i}}(C\_{ijt}^{P}\*P\_{ijt }+ C\_{it}^{I}I\_{it })$$

Constraints:

$P\_{ijt }, I\_{it }\geq 0 and int, i\in \{1,2\} ,t\in (1,2,3), k\in (1,2) \left(1\right)$ decision var are non-negative and integer

$\sum\_{i=1}^{N}\sum\_{j=1}^{m\_{i}}a\_{ijk}P\_{ijt} \leq A\_{kt} \left(2\right) $Production must not be exceeding the available resources

Optimal Solution.

The following is the solution obtained from Excel Solver. The total cost is $379,658.

