I pledge on my honor that I have not given or received any unauthorized assistance on this

assignment/examination. I further pledge that I have not copied any material from a book, article,

the Internet or any other source except where I have expressly cited the source.

Signature: Kanika Yadav

Date: 09/22/2022

Topic name -

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Date: September 22, 2022

W&A Chapter - 3

Question No – Q18 & Q 34

Page no – 117 & 124

**Management Overview**

**Q18 .**

**Problem Statement:**

Can you guess the results of a sensitivity analysis on the initial inventory in the Pigskin model? See if your guess is correct by using SolverTable and allowing the initial inventory to vary from 0 to 10,000 in increments of 1000. Keep track of the values in the changing cells and the objective cell.

**Data Sources:**

4Edition Q18 or 3Edition Q17, instead of using the data from the textbook, some data will modified:

a) Month:             1                2                 3                 4                 5                 6

Production cost/unit:         $11.80       $12.55       $15.35       $12.10       $12.30      $12.95

b) other data keeps the same from textbook

c) In instead of the initial inventory, the problem is changed to ask the sensitivity analysis about the storage capacity using solver table (Note: the storage capacity should be the same for each month)

if not install solver table yet, solver table is available at this link: https://host.kelley.iu.edu/albright/free\_downloads.htm

**Model Approach**

* Listing all the Input parameters, Input data and define name ranges
* Define Prdocution quantities in range Units\_produced
* On hand inventory after production
* Ending inventories to calculate inventory in current month
* Production and holding coststo calculate the cost totals with Sum function
* Using Solver- add production quantities constraints, on gand inventories after production and ending inventories that cannot exceed storage capacities
* Check the non negative option
* Get the optimal solution clicking on Solve

**Solution & Sensitivity Analysis:**

2 possibilities –

SolverTable used to perform interesting sensitivity analyses

1. Most inventory ever carried at the end of month 5000 storage capacity is 10000.
2. Holding cost percentage, 5% is large.
3. Single input and output is the maximum ending inventory ever held that can be calculated in using formular MAX(ending inventory)
4. The solution can be interpreted best by comparing production quantities to demands.
5. the storage capacity limit is reached only when the holding cost percentage falls to 1%. holding cost percentage reaches 10%, the company still continues to hold a maximum ending inventory of 5000.
6. The optimal solution to Pigskin’s model specifies the production level for each of the next six months. In reality, however, the company would probably implement the model’s recommendation only for the first month. Then at the beginning of the second month, it would gather new forecasts for the next six months, months 2 through 7, solve a new six-month model, and again implement the model’s recommendation for the first of these months, month 2. If the company continues in this manner, we say that it is following a six-month rolling planning horizon.
7. The first six rows are for sensitivity to changes in the storage capacity, whereas the last six are for sensitivity to changes in the demand.
8. Based on solver table results, the conclusion is optimal production quantity in month 1 is fairly insensitive to the possibly inaccurate forecasts for months 5 and 6.
9. For Multiperiod production model, the total optimal cost solution is - $15,64,837.50
10. Using the solver table analysis shows the input cell values gradually increases.

**2. Environment Problem**

**4Edition Q34 or 3Edition Q35**

**Problem Statement:**

|  |
| --- |
| There are three factories on the Momiss River. Each emits two types of pollutants, labeled P1 and P2, into the river. If the waste from each factory is processed, the pollution in the river can be reduced. It costs $1500 to process a ton of factory 1 waste, and each ton processed reduces the amount of P1 by 0.10 ton and the amount of P2 by 0.45 ton. It costs $1000 to process a ton of factory 2 waste, and each ton processed reduces the amount of P1 by 0.20 ton and the amount of P2 by 0.25 ton. It costs $2000 to process a ton of factory 3 waste, and each ton processed reduces the amount of P1 by 0.40 ton and the amount of P2 by 0.30 ton. The state wants to reduce the amount of P1 in the river by at least 30 tons and the amount of P2 by at least 40 tons. |
|  |
| a) Use Solver to determine how to minimize the cost of reducing pollution by the desired amounts. Are the LP assumptions (proportionality, additivity, divisibility) reasonable in this problem? |
| b) Use SolverTable to investigate the effects of increases in the minimal reductions required by the state. Specifically, see what happens to the amounts of waste processed at the three factories and the total cost if both requirements (currently 30 and 40 tons, respectively) are increased by the same percentage. Revise your model so that you can use SolverTable to investigate these changes when the percentage increase varies from 10% to 100% in increments of 10%. Do the amounts processed at the three factories and the total cost change in a linear manner? |

**Data Sources:**

From the above question statement

**Model Approach:**

Using Solver Table, we calculate the optimal solution

**Solution & Sensitivity Analysis:**

Using Solver, we set the Objective target to minimize the cost of reducing pollution,

We use Simplex Method to get a solution to evaluate the number to produce values

Clicking on Solve gives us the resultant optimal solution to the given problem and constraints.

The waste processed has to be reduced and the cost of reducing pollution should be reduced to minimal along with the consideration of the constraints of P1 & P2 criteria.

Cost of reducing the pollution should be minimal.   
  
Using the sensitivity analysis when we perform the percentage increase for the P1 & P2 it impacts directly as shown in the graph with the resultant costs of waste to be processed as the Pi & P2 waste from Factory 1 & Factory 2 increases over the time.

**Conclusion:**

For 100-100% increment in total cost, which apparently increases as we increase the allowance of pollutants in the environment. The sensitivity graph clearly shows its impact on the Total cost incurred to the companies on account of changing the % of P1&P2 pollutants in the environment.

The solverTable is great help in defining the impact of change in parameters on various other attributes overall resulting to the impact on the resultant cost.