Management Science Individual Assignment 2

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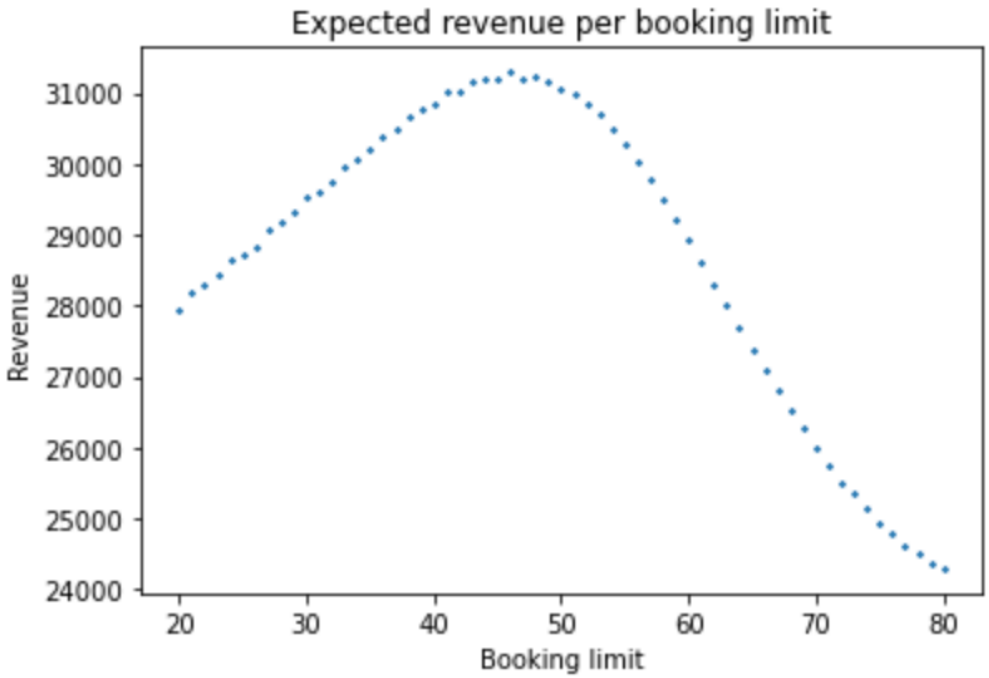
1 Question 1

The Gurobi code revealed that Mary should swim freestyle, Lina should swim breaststroke, Asma should swim backstroke, and Carol should swim butterfly stroke. The total time will be 128.7 seconds.

2 Question 2

2.1 A

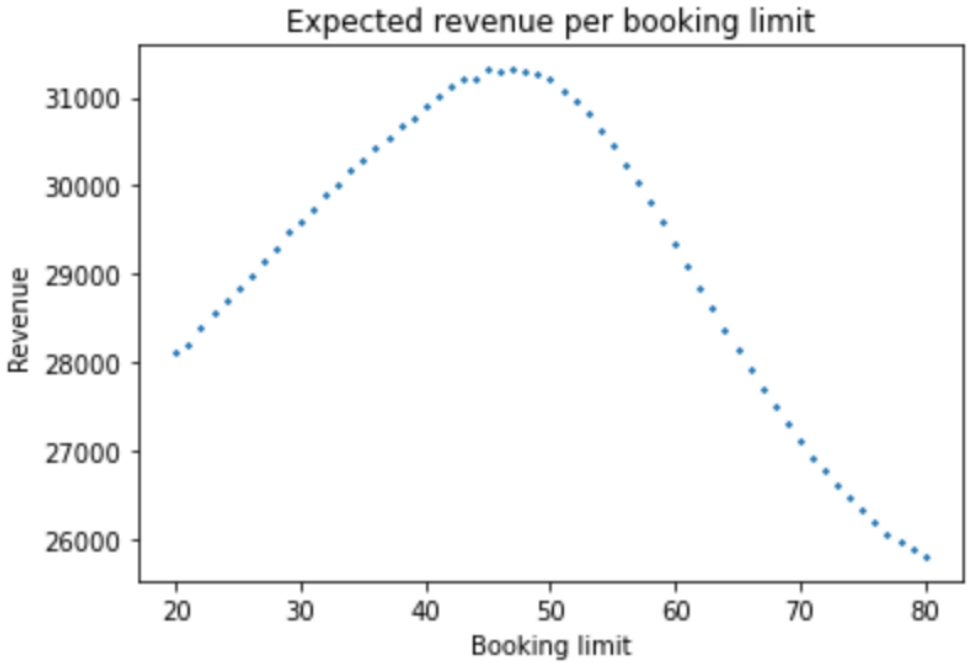
The optimal booking limit was chosen to be 46 seats out of 80. The expected revenue reached its peak at 31297.52.



The graph which illustrates the change in the expected revenue is present above.

2.2 B

The optimal booking limit was chosen to be 45 seats out of 80. In order to maximize revenue, the compensation has to be set to 150 which is like not adding a compensation. This analysis reveals that the compensation idea might not work out. The expected revenue is the same.



The graph which illustrates the change in the expected revenue is present above.

3 Question 3

3.1 A1

The stochastic program is presented below.

minimize

$0.3 * 30 * (\text{Da1} + \text{Da2} + \text{Da3} + \text{Da4})$

$+0.2 * 30 * (\text{Db1} + \text{Db2} + \text{Db3} + \text{Db4})$

$+0.5 * 30 * (\text{Dc1} + \text{Dc2} + \text{Dc3} + \text{Dc4})$

$-10 * \text{TotalProduced} - \text{PF}_\text{A} - 1.5 * \text{PF}_\text{B}$

$-1.5 * \text{CostA1} - 2 * \text{CostA2} - 2 * \text{CostA3} - 3 * \text{CostA4}$

$-2 * \text{CostB1} - 1.2 * \text{CostB2} - 1.1 * \text{CostB3} - 2.5 * \text{CostB4}$

subject to

The total amount of products in circulation will not pass total produced produts

$\sum Sent_A^j + Sent_B^j \leq TotalProduced, \forall j \in (a, b, c)$

Sent products will be less than or equal to demand in every case

$$\sum_{i \in (1,2,3,4)} Sent_{Ai}^j + Sent_{Bi}^j \leq \sum_{i \in (1,2,3,4)} D_i^j, \forall j \in (a, b, c)$$

PF to Warehouse X will be equal to Warehouse X to DCs

$$Sent_X^j = \sum_{i \in (1,2,3,4)} Sent_{Xi}^j, \forall j \in (a, b, c), \forall X \in (A, B)$$

Demand Limits

$D_1^a = 5000, D_2^a = 3000, D_3^a = 7800, D_4^a = 4000$

$D_1^b = 3000, D_2^b = 1000, D_3^b = 6000, D_4^b = 3000$

$D_1^c = 4200, D_2^c = 4100, D_3^c = 3000, D_4^c = 5400$

Sent variables can't be negative

$Sent_X^j \geq 0, \forall j \in (a, b, c,), \forall X \in (A, B)$

3.2 A2

The program above was to construct an algorithm which solves the case in Gurobi. It revealed that in total 16700 products should be produced. In scenario a, 5900 and 10800 units should be sent to warehouses A and B, respectively. For scenario b, 3000 and 10000 units should be sent to warehouses A and B. Finally, for scenario c, 9600 and 7100 units should be sent to warehouses A and B.

The Gurobi code also shows the optimal distributions from production facilities to warehouses, and from warehouses to distribution centers depending on the demands as well.