

Assignment 4 - Prescriptive Analysis

Part 4: Location Diversification

4.a

The number of hotels opened in each city are as follows:

- Eureka - 1 Hotel
- Fresno - 4 Hotels
- Long Beach - 1 Hotel
- Los Angeles - 3 Hotels
- South Lake Tahoe - 7 Hotels

4.b

The additional constraints that we need to add to the model are as follows:

- Constraint 4: $x_2 + x_3 + x_4 + x_5 \leq 2$ (Fresno Hotels)
- Constraint 5: $x_7 + x_8 + x_9 \leq 2$ (Los Angeles Hotels)
- Constraint 6: $x_{10} + x_{11} + x_{12} + x_{13} + x_{14} + x_{15} + x_{16} \leq 2$ (South Lake Tahoe Hotels)

I expect the new optimal objective function value to be smaller than before as we have introduced three new constraints, which essentially limit the number of hotels we are allowed to select from one city, which means that we won't be able to select more than 2 hotels from a city even if it results in a larger predicted profitability.

4.c

Hotel_i	Hotel_1	Hotel_2	Hotel_3	Hotel_4	Hotel_5	Hotel_6	Hotel_7	Hotel_8	Hotel_9	Hotel_10	Hotel_11	Hotel_12	Hotel_13	Hotel_14	Hotel_15	Hotel_16
Decision Variables	0	0	1	0	1	0	1	1	0	0	0	0	0	0	1	1
Price of Hotel (\$)	2925000	10000000	3750000	3500000	325000	8950000	1950000	1750000	4900000	1650000	1125000	2500000	1975000	3750000	1475000	750000
Predicted Profitability	37.57062587	52.14527377	41.53979933	41.11558035	35.72799933	47.17751236	56.6700963	56.33072112	61.67588024	37.50134723	36.61048737	38.94369175	38.0528319	41.06478664	37.20439394	35.97415891
Constraint_Values	Operator	Max_Value														
6	<=	16														
10000000	<=	10000000														
2	<=	2														
2	<=	2														
2	<=	2														
Max_P =	263.4471689															

4.d

Based on this model, we should purchase Hotel 3, Hotel 5, Hotel 7, Hotel 8, Hotel 15 and Hotel 16, resulting in a total profitability of 263.45. As expected, this is about 34.01 units less than the total profitability achieved in the previous model, due to the added constraints. It should be noted that, in a real life scenario this model might be more practical as it expands the franchise in multiple cities with a minor loss in profitability.