IE432 - Project Stage 2

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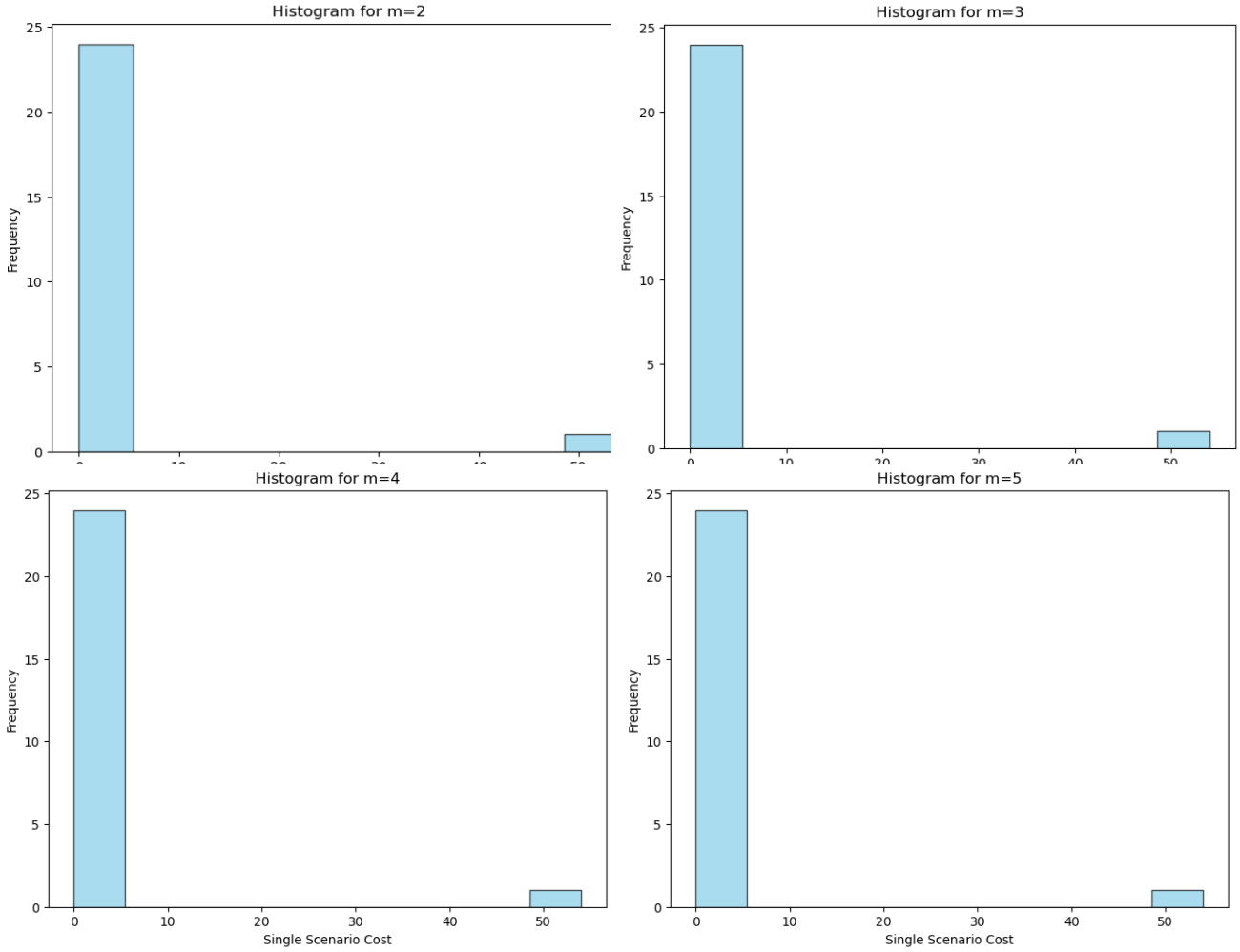
Initially, the model of SSLP in hand was solved using Gurobi. The optimal solution was found to be -241.27999999999955, which is the minimum difference between the cost and revenue.

After that, the given dis-utility function is considered. This piecewise function behaves as y=x for x<0 and as y=mx for x>=0. This means that for values of x greater than zero, the disutility increases much faster compared to the output of negative x values. This piecewise function was put through a loop in Python to see whether or not it is convex (or concave). The basic definition of concavity/convexity is used as a reference. The code outputs that the piecewise function was convex. Hence, the decision-maker behaves in such a way that she is risk-averse in her decisions.

m	Mean	Standard Deviation	Optimal Objective Value
2	2.16	10.581795688823329	4.319999999999999
3	2.16	10.581795688823329	6.479999999999995
4	2.1599999999999953	10.581795688823329	8.64
5	2.16	10.581795688823329	10.8

The optimal objective value was found to be -241.28. Then, as visible on the above graph, each m's objective value is found to be as such. As the m value increases, the slope of the graph when x>0 increases, which means the disutility trendline gets steeper and represents more risk-averseness. On the other hand, since we are working on a minimization formula, we get more desirable results with lower m values (basically utility gets less affected from losing money). Despite these results, we can say that the decision-maker is quite risk-averse and that she is hesitant to open plants in locations with the given disutility outputs.

The histograms for different m values and the box-and-plot whisker chart were also plotted for these cost values.
For the 25 different scenarios in hand, the frequency of cost values are found as follows:



For each m value, histograms suggest that only one scenario occurred and resulted with a cost of 54. In the other scenarios, the plants were not located in order to minimize the disutility.

In addition to that, with the box-and-whisker plot below, the distribution of the chosen single scenarios and their corresponding costs are visible for each m value. It also suggests that cost is incurred only in one scenario with a value of 54 for each m value, the rest of the scenarios cost 0.