

CS 635: Tools and Environments for Optimization

Homework 12: Advanced Formulation Exercises

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Submit this assignment electronically using the instructions on the course web page. The assignment name is hw12 and you should hand in exactly 3 files with the following names: hw12-1.gms, hw12-2.gms, hw12-2.pdf

1. Suppose you have a number of spheres of different radii with their centers given. Find the radius and center of the smallest sphere that encloses all these spheres. Ensure you use a SOCP formulation for this.

Use the following GAMS code to generate a data set to test your formulation:

```
$if not set n $set n 2000
set i /1*%n%/;
set j /1*3/;

* generate random reproducible data
option seed = 101;

parameter r(i); r(i) = uniform(0,0.2);
parameter c(i,j); c(i,j) = uniform(0,1);
```

2. Newsboy problem: For a newsboy who sells papers on a street corner, the demand is uncertain, and the newsboy must decide how many papers to buy from his supplier. If he buys too many papers he is left with unsold papers that only have a small salvage value at the end of the day; if he buys too few papers he has lost the opportunity of making a higher profit.

From past history, the newsboy makes probability estimates for each demand.

Suppose that the newsboy gets discounting when he purchases newspapers from his supplier so that his purchase price for x newspapers is given below:

```
if 0 < x <= 10 price is 25*x
    10 < x <= 20      20*x
    20 < x            15*x
```

Suppose further that his salvage value is 10, and he can sell newspapers for 30. Determine how many newspapers he should purchase to maximize his expected profit.

The data for this problem can be generated using:

```
option seed = 231;
set scenario /1*15/;
parameter demand(scenario) demand in given scenario,
    prob(scenario) probability scenario occurs;

demand(scenario) = round(uniform(0,35));
prob(scenario) = uniform(0,1);
scalar normalize;
normalize = sum(scenario,prob(scenario));
prob(scenario) = prob(scenario)/normalize;
```

Modify your GAMS code to calculate the maximum profit when the salvage value is given by an input parameter h . Generate and hand in a plot that shows the max profit for all h between 0 and 25, and the number of newspapers the newsboy should buy for each value of h . The plot can be a pdf file, or a word document.