FIN 372 / STA 372

Optimization Methods in Finance: Homework 2

Non-graded problems

This assignment is graded on Credit/No-Credit.

That is, if you complete the homework, and it is acceptable, you will get credit. If you do not submit or if the submitted work is not acceptable, you will not get credit. Getting a credit is required to obtain a grade for the group project that follows.

Problem 1:

Max is in a pie eating contest that lasts 1 hour. Each torte that he eats takes 2 minutes. Each apple pie that he eats takes 3 minutes. He receives 4 points for each torte and 5 points for each pie. What should Max eat so as to get the most points? Solve the problem using the graphical method.

Next, let's see what happens if he would like to stick to his preference of eating at least as many pies as tortes. That is, the number of pies he eats should be greater than or equal to the number of tortes. By how many points does this constraint decrease Max's total points?

Problem 2:

A farmer in Iowa owns 450 acres of land. He is going to plant each acre with wheat or corn. Each acre planted with wheat yields $2,000 profit, requires three workers, and requires two tons of fertilizer. Each acre planted with corn yields $3,000 profit, requires

two workers, and requires four tons of fertilizer. There are currently 1,000 workers and 1,200 tons of fertilizer available.

a) Formulate the optimization problem and solve the problem graphically
b) Solve the problem in R and verify that the solutions are the same
c) What happens to the decision variables and the total profit when the availability of fertilizer varies from 200 tons to 2200 tons in 100-ton increments? When does the farmer discontinue producing wheat? When does he discontinue producing corn? How does the profit change for each 10-ton increment?

Problem 3:

Star Oil Company is considering five different investment opportunities. The cash out-flows and net present values (in millions of dollars) are given in Table 1 below. Star Oil has $40 million available for investment now (time 0); it estimates that one year from now (time 1) $20 million will be available for investment. Star Oil may purchase any fraction of each investment. In this case, the cash outflows and NPV are adjusted accordingly. For example, if Star Oil purchases one-fifth of investment 3, then a cash outflow of 1/5 * 5 = $1 million would be required at time 0, and a cash outflow of 1/5 * 5 = $1 million would be required at time 1. The one-fifth share of investment 3 would yield an NPV of 1/5*16=$3.2 million. Star Oil wants to maximize the NPV that can be obtained by investing in investments 1-5. Formulate an LP that will help achieve this goal. Assume that any funds leftover at time 0 cannot be used at time 1.

Table 1: Cash Flows and Net Present Value for Investments in Capital Budgeting

	Investment ($)				
	1	2	3	4	5
Time 0 cash outflow	11	53	5	5	29
Time 1 cash outflow	3	6	5	1	34
NPV	13	16	16	14	39

Deliverables

Scan your homework and name it as **hw2_x.pdf**(where x is your eid) and submit it online.