Assignment - 9

## R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

rm(list = ls())  
library(lpSolveAPI)

What mix of 3 new product needs to be produced my Emax Corporation.

Management wants primary consideration given to three factors: total profit, stability in the workforce, and achieving an increase in the company’s earnings next year from the $75 million

Lets assume that x1 is the rate of production for Unit 1, x2 is the rate of production for Unit 2, x3 is the rate of production for Unit 3.

We introduce auxiliary variable y1n, y1n and y2n. These are variables will hold the value of the chnages or delta values.

Now, Emax want to Maximize Z = P - 6C - 3D,

where P = total (discounted) profit over the life of the new products, C = change (in either direction) in the current level of employment, D = decrease (if any) in next year’s earnings from the current year’s level.

If we rewrite the objective function using the auxiliary variable, then objective function gets formulate like below:

Maximize P-6(y1p-y1n)-3y2n Please note that we have already removed or made the value of y2p because for increase in value more than 75M, Thus increase in amount in expected but not decrease. Thus, y2p=0.

Thus forming LP function as below:

// Objective function max: P -6 y1p + 6 y1n - 3 y2n;

// Constraints 6 x1 + 4 x2 + 5 x3 + y2n = 75; 8 x1 + 7 x2 + 5 x3 + y1p - y1n = 50; 20 x1 + 15 x2 + 25 x3 = P;

## Formulation and Solution

mx <- read.lp("emax.lp")  
mx

## Model name:   
## P y1p y1n y2n x1 x2 x3   
## Maximize 1 -6 6 -3 0 0 0   
## R1 0 0 0 1 6 4 5 = 75  
## R2 0 1 -1 0 8 7 5 = 50  
## R3 -1 0 0 0 20 15 25 = 0  
## Kind Std Std Std Std Std Std Std   
## Type Real Real Real Real Real Real Real   
## Upper Inf Inf Inf Inf Inf Inf Inf   
## Lower 0 0 0 0 0 0 0

solve(mx)

## [1] 0

get.objective(mx)

## [1] 768.75

get.variables(mx)

## [1] 281.25 0.00 81.25 0.00 0.00 18.75 0.00

Objective function value is 768.75 which is overall profit of the company

Rate of production of Product 1 = 0 Rate of production of Product 2 = 18.75 Rate of production of Product 3 = 0