QM_assignment_5

2022-11-07

#In light of objective function and restrictions, such as employment levels and corporate revenues, the Emax corporation's goal is to maximize profit of new items.

#Libraries for the current environment

```
library(lpSolve)
library(lpSolveAPI)
library(goalprog)
```

#Where #P = total (discounted) profit over the life of the new products, the objective function #Maximize Z = P - 6C - 3D, #C = Change (in either direction) in the level of employment at the moment, and #D = Decrease (if any) in earnings from the level of the present year in the following year.

#Each new product's lptable is displayed in the table.

```
lp_table<- matrix(c("Total Profit", "Employment Level", "Earnings Next Year",
                        20,6,8,
                        15,4,7,
                        25,5,5,
                        "Maximize","=50",">=75",
                        "Millions of Dollars", "Hundreds of Employees", "Millions of Dollars"), ncol=6, 
colnames(lp_table) <- c("Factor","Product 1", "Product 2", "Product 3", "Goal", "Units")
as.table(lp_table)
```

```
##   Factor             Product 1 Product 2 Product 3 Goal
## A Total Profit       20        15        25        Maximize
## B Employment Level   6         4         5         =50
## C Earnings Next Year 8         7         5         >=75
##   Units
## A Millions of Dollars
## B Hundreds of Employees
## C Millions of Dollars
```

#Under goal programming, the objective functions were imported via a Lp file. The formulations utilized for the objective function and constraints to the lp formulation are as follows:

#Maximum objective function: 20x1, 15x2, and 25x3 - 6y1m, 6y1p, and 3y2m;

#Constraints #6x1 + 4x2 + 5x3 + y1m - y1p = 50; #8x1 + 7x2 + 5x3 + y2m - y2p = 75;

```
getwd()
```

```
## [1] "/Users/bharathreddy/Desktop"
```

```
setwd("/Users/bharathreddy/Desktop")
lp<-read.lp("gp.lp")
lp
```

```
## Model name:
##             x1    x2    x3   y1m   y1p   y2m   y2p
```

```
## Maximize    20    15    25    -6    -6    -3     0
## R1           6     4     5     1    -1     0     0  =  50
## R2           8     7     5     0     0     1    -1  =  75
## 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
```

#Goal programming model

```
solve(lp)
```

```
## [1] 0
```

#The result of the formulation of lp is 0, indicating success.

Purposeful action to maximize profit.

```
get.objective(lp)
```

```
## [1] 225
```

#Variable value of goal programming model

```
get.variables(lp)
```

```
## [1]  0  0 15  0 25  0  0
```

#interpretation #1. From above, it is evident that X3 has undergone a metamorphosis. The only product that the company can create, 15 units of Product 3, is the one that will maximize profit.

#2.The firm's employment levels were exceeded by 25 hundred employees despite the fact that the maximum number of employees was 50 hundred, as per the restrictions outlined above.

#3. The intention of Y2P and Y2M was to detect any variances in earnings for the next year. According to the formulation above, it exhibited no deviations.

#4. The company is maximizing a 225 million dollar profit.