QMM Assignment 5

Laya Sree Gangula

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```
#The Research and Development department at Emax Corporation has developed three new items. It is now n
#1. Total Profit,
#2. stable employment conditions and
#3.double the company's earnings from this year's $75 million in the following year.
#Objective Function
#Maximize Z = P - 6C - 3D, where
#P = Over the course of the new products, the overall discounted profit,
#C = Change relative to the current employment level, in either direction,
#D = Reduce the earnings from the level of the current year, if necessary.
```

Setting default values to get a clean output

```
knitr::opts_chunk$set(message = FALSE)
knitr::opts_chunk$set(warning = FALSE)
```

Loading the required packages

```
library(lpSolve)
library(lpSolveAPI)
library(latexpdf)
```

```
#creating the model after loading the LP file from the current directory.
#The amounts above and below the employment level goal, if any, are referred to as Y1plus and Y1minus,
#equivalent definitions of y2plus and y2minus for the purpose of determining earnings the following yea
#Assign the variables x1, x2, and x3 the production levels of Products 1, 2, and 3, respectively.
#P can also be expressed in terms of x1, x2, and x3, as well as the objective function, y1plus, y1minus
```

```
emax.1 <- read.lp("emax.lp", type = c("lp"))
print(emax.1)
```

```
## Model name:
##             X1    X2    X3   Y1P   Y1M   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
```

```
#The impacts of each of the innovative products (per unit of production) on all of these factors are sh
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```
emax.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(emax.table) <- c("Factor","Product 1", "Product 2", "Product 3", "Goal", "Units")
as.table(emax.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
```

```
#figuring out the goal programming paradigm to determine the variable and objective values
solve(emax.1)
```

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

```
get.objective(emax.1)
```

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

```
get.variables(emax.1)
```

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

```
#Interpretation:
#1.The business must employ X1, X2, and X3 as the units of combination in order to maximize the target 
#2.With a cap of 50 hundred employees as the maximum, the objective was to stabilize employment levels.
#3. The goal of y2plus and y2minus was to quantify the increase or decrease in earnings relative to the
#4. The value of the objective function, in this case 225 million dollars, highlights the profit that t
```