QMM Assignment

Sri Hari Vadhry

2023-09-23

```
library(lpSolve)
```

Objective Function- How many products to be produced by each plant to maximize the profit and to check on avoiding layoff by using same percentage of excess production capacity

```
objective <- c(420, 360, 300, 420, 360, 300, 420, 360, 300)
```

Below are the constraints and Non negative constraints are assumed by default

1. Excess production capacity constraints
2. Storage capacity constraints
3. sales constraints
4. Employee layoff constraints

```
constraints <- matrix(c(1, 1, 1, 0, 0, 0, 0, 0, 0,
                        0, 0, 0, 1, 1, 1, 0, 0, 0,
                        0, 0, 0, 0, 0, 0, 1, 1, 1,
                        20, 15, 12, 0, 0, 0, 0, 0, 0,
                        0, 0, 0, 20, 15, 12, 0, 0, 0,
                        0, 0, 0, 0, 0, 0, 20, 15, 12,
                        1, 0, 0, 1, 0, 0, 1, 0, 0,
                        0, 1, 0, 0, 1, 0, 0, 1, 0,
                        0, 0, 1, 0, 0, 1, 0, 0, 1,
                        900, 900, 900, -750, -750, -750, 0, 0, 0,
                        0, 0, 0, 450, 450, 450, -900, -900, -900,
                        450, 450, 450, 0, 0, 0, -750, -750, -750), nrow=12, byrow= TRUE)
constraints
```

```
##       [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9]
##  [1,]    1    1    1    0    0    0    0    0    0
##  [2,]    0    0    0    1    1    1    0    0    0
##  [3,]    0    0    0    0    0    0    1    1    1
##  [4,]   20   15   12    0    0    0    0    0    0
##  [5,]    0    0    0   20   15   12    0    0    0
##  [6,]    0    0    0    0    0    0   20   15   12
##  [7,]    1    0    0    1    0    0    1    0    0
##  [8,]    0    1    0    0    1    0    0    1    0
##  [9,]    0    0    1    0    0    1    0    0    1
## [10,]  900  900  900 -750 -750 -750    0    0    0
## [11,]    0    0    0  450  450  450 -900 -900 -900
## [12,]  450  450  450    0    0    0 -750 -750 -750
```

#Inequality Signs

```
signs <-c("<=",
          "<=",
          "<=",
          "<=",
          "<=",
          "<=",
          "<=",
          "<=",
          "<=",
          "=",
          "=",
          "=")
```

Right Hand Side Coefficents

```
rhs <- c(750,
         900,
         450,
         13000,
         12000,
         5000,
         900,
         1200,
         750,
         0,
         0,
         0)
```

Profit maximization

```
Maximize_Z = lp("max", objective, constraints, signs, rhs, int.vec = 1:9)

Maximize_Z
```

```
## Success: the objective function is 694680
```

Decision Variables

```
Maximize_Z$solution
```

```
## [1] 530 160   0   0 688 140   1   8 405
```