Qmm Assignmnt 1

PRAVALIKA

2022-09-23

```r
#install.packages("lpSolve")

library("lpSolve") #Activating the lpSolve Package
```

Further going down in order to solve the problem we need to define the objective, constraints, direction and constants

Objective Function

The Objective function is to $Max \ Z = 420(L_1 + L_2 + L_3) + 360(M_1 + M_2 + M_3) + 300(S_1 + S_2 + S_3)$

$$ $$
$$ $$

which can be written as $Z = 420L_1 + 360M_1 + 300S_1 + 420L_2 + 360M_2 + 300S_2 + 420L_3 + 360M_3 + 300S_3$

Subject to the following constraints

$$L_1 + M_1 + S_1 \leq 750$$

$$L_2 + M_2 + S_2 \leq 900$$

$$L_3 + M_3 + S_3 \leq 450$$

$$20L_1 + 15M_1 + 12S_1 \leq 13000$$

$$20L_2 + 15M_2 + 12S_2 \leq 12000$$

$$20L_3 + 15M_3 + 12S_3 \leq 5000$$

$$L_1 + L_2 + L_3 \leq 900$$

$$M_1 + M_2 + M_3 \leq 1200$$

$$S_1 + S_2 + S_3 \leq 750$$

Non Negativity Constraints

$$L_1, L_2, L_3, M_1, M_2, M_3, S_1, S_2, S_3 \geq 0$$

The above constraints can be written as below

$$L_1 + M_1 + S_1 + 0L_2 + 0M_2 + 0S_2 + 0L_3 + 0M_3 + 0S_3 \leq 750$$

$$0L_1 + 0M_1 + 0S_1 + L_2 + M_2 + S_2 + 0L_3 + 0M_3 + 0S_3 \leq 900$$

$$0L_1 + 0M_1 + 0S_1 + 0L_2 + 0M_2 + 0S_2 + L_3 + M_3 + S_3 \leq 450$$

$$20L_1 + 15M_1 + 12S_1 + 0L_2 + 0M_2 + 0S_2 + 0L_3 + 0M_3 + 0S_3 \leq 13000$$

$$0L_1 + 0M_1 + 0S_1 + 20L_2 + 15M_2 + 12S_2 + 0L_3 + 0M_3 + 0S_3 \leq 12000$$

$$0L_1 + 0M_1 + 0S_1 + 0L_2 + 0M_2 + 0S_2 + 20L_3 + 15M_3 + 12S_3 \leq 5000$$

$$L_1 + 0M_1 + 0S_1 + L_2 + 0M_2 + 0S_2 + L_3 + 0M_3 + 0S_3 \leq 900$$

$$0L_1 + M_1 + 0S_1 + 0L_2 + M_2 + 0S_2 + 0L_3 + M_3 + 0S_3 \leq 1200$$

$$0L_1 + 0M_1 + S_1 + 0L_2 + 0M_2 + S_2 + 0L_3 + 0M_3 + S_3 \leq 750$$

Defining the Objective Function - f.obj

```
f.obj <- c(420, 360, 300, 420, 360, 300, 420, 360, 300)
```

Defining the Constraints - f.con

```
f.con <- 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), nrow = 9, byrow=T)
```

2

Defining the Direction of the constraints - f.dir

```r
f.dir <- c("<=",
          "<=",
          "<=",
          "<=",
          "<=",
          "<=",
          "<=",
          "<=",
          "<=")
```

Defining the constants i.e. the right hand side values - f.rhs

```r
f.rhs <- c(750, 900, 450, 13000, 12000, 5000, 900, 1200, 750)
```

Calling the lp function to solve the problem basing the objective function i.e. to maximize the profits

```r
lp("max", f.obj, f.con, f.dir, f.rhs)
```

```
## Success: the objective function is 708000
```

Calling the lp function again to get the values for the variables defined above

```r
lp("max", f.obj, f.con, f.dir, f.rhs)$solution
```

```
## [1] 350.0000 400.0000   0.0000   0.0000 400.0000 500.0000   0.0000 133.3333
## [9] 250.0000
```