Quant Management Assignment#4

#This notebook contains the code for the Assignment 4.

#Install lpSolveAPI package if not alresdy installed

```
#install.packages("lpSolveAPI")
```

#Now, load the library

```
library(lpSolveAPI)
```

#Let us set up the Weigelt Corporation problem. Note that we had 9 decision variables, and 11 constraints.

```
lprec <- make.lp(11, 9)
```

set the maximization objective function

```
set.objfn(lprec, c(420, 360, 300, 420, 360, 300, 420, 360, 300))
lp.control(lprec,sense='max')
```

```
## $anti.degen
## [1] "fixedvars" "stalling"
##
## $basis.crash
## [1] "none"
##
## $bb.depthlimit
## [1] -50
##
## $bb.floorfirst
## [1] "automatic"
##
## $bb.rule
## [1] "pseudononint" "greedy"       "dynamic"      "rcostfixing"
##
## $break.at.first
## [1] FALSE
##
## $break.at.value
## [1] 1e+30
##
## $epsilon
##       epsb       epsd      epsel     epsint epsperturb   epspivot
##      1e-10      1e-09      1e-12      1e-07      1e-05      2e-07
##
## $improve
## [1] "dualfeas" "thetagap"
##
## $infinite
## [1] 1e+30
##
## $maxpivot
## [1] 250
##
## $mip.gap
## absolute relative
##    1e-11    1e-11
##
## $negrange
## [1] -1e+06
##
## $obj.in.basis
## [1] TRUE
##
## $pivoting
## [1] "devex"    "adaptive"
##
## $presolve
## [1] "none"
##
## $scalelimit
## [1] 5
##
## $scaling
## [1] "geometric"   "equilibrate" "integers"
##
## $sense
## [1] "maximize"
##
## $simplextype
## [1] "dual"   "primal"
##
## $timeout
## [1] 0
##
## $verbose
## [1] "neutral"
```

set values for the rows (set the Left hand side constraints)

```
set.row(lprec, 1, c(1, 1, 1), indices = c(1, 2, 3))
set.row(lprec, 2, c(1, 1, 1), indices = c(4, 5, 6))
set.row(lprec, 3, c(1, 1, 1), indices = c(7, 8, 9))
set.row(lprec, 4, c(20, 15, 12), indices = c(1, 2, 3))
set.row(lprec, 5, c(20, 15, 12), indices = c(4, 5, 6))
set.row(lprec, 6, c(20, 15, 12), indices = c(7, 8, 9))
set.row(lprec, 7, c(1, 1, 1), indices = c(1, 4, 7))
set.row(lprec, 8, c(1, 1, 1), indices = c(2, 5, 8))
set.row(lprec, 9, c(1, 1, 1), indices = c(3, 6, 9))
set.row(lprec, 10, c(900, 900, 900, -750, -750 ,-750), indices = c(1, 2, 3, 4, 5, 6))
set.row(lprec, 11, c(450, 450, 450, -900, -900, -900), indices = c(4, 5, 6, 7, 8, 9))
```

set the right hand side values

```
rhs <- c(700, 900, 450, 13000, 12000, 5000, 900, 1200, 750, 0, 0)
set.rhs(lprec, rhs)
```

set constraint type and set variable types and bound

```
set.constr.type(lprec, c("<=", "<=", "<=", "<=", "<=", "<=", "<=", "<=", "<=", "=", "="))
set.bounds(lprec, lower = rep(0, 9))
```

finally, name the decision variables (column) and constraints (rows)

```
lp.rownames <- c("Plant1Production", "Plant2Production", "Plant3Production", "Plant1Space", "Plant2Space", "Plant3Space", "Plant1Forecast", "Plant2Forecast", "Plant3Forecast", "Capacity1", "Capacity2")
lp.colnames <- c("Plant1Large", "Plant1Medium", "Plant1Small","Plant2Large", "Plant2Medium", "Plant2Small","Plant3Large", "Plant3Medium", "Plant3Small")
dimnames(lprec) <- list(lp.rownames, lp.colnames)
```

view the linear program object to make sure it's correct

```
lprec
```

```
## Model name:
##   a linear program with 9 decision variables and 11 constraints
```

#Save this into a file

```
write.lp(lprec, filename = "weiglet.lp", type = "lp")
```

now solve the model

```
solve(lprec)
```

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

#Show the value of objective function, variables, constraints and slack

```
get.objective(lprec)
```

```
## [1] 696000
```

```
get.variables(lprec)
```

```
## [1] 516.6667 177.7778   0.0000   0.0000 666.6667 166.6667   0.0000   0.0000
## [9] 416.6667
```

```
get.constraints(lprec)
```

```
##  [1]   694.4444   833.3333   416.6667 13000.0000 12000.0000  5000.0000
##  [7]   516.6667   844.4444   583.3333     0.0000     0.0000
```

```
get.constraints(lprec) - rhs
```

```
##  [1] -5.555556e+00 -6.666667e+01 -3.333333e+01  0.000000e+00  1.818989e-12
##  [6]  0.000000e+00 -3.833333e+02 -3.555556e+02 -1.666667e+02  0.000000e+00
## [11]  0.000000e+00
```

#Also,We can now read the lp formulation using an lp file and solve it. I am using the same lp file which I have saved above.

#read from file and solve it

```
x <- read.lp("weiglet.lp") # create an lp object x
x                          # display x
```

```
## Model name:
##   a linear program with 9 decision variables and 11 constraints
```

```
solve(x)                   # Solution
```

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

```
get.objective(x)           # get objective value
```

```
## [1] 696000
```

```
get.variables(x)           # get values of decision variables
```

```
## [1] 516.6667 177.7778   0.0000   0.0000 666.6667 166.6667   0.0000   0.0000
## [9] 416.6667
```

```
get.constraints(x)         # get constraints
```

```
##  [1]   694.4444   833.3333   416.6667 13000.0000 12000.0000  5000.0000
##  [7]   516.6667   844.4444   583.3333     0.0000     0.0000
```