HW9_MGT3_CLOM

Celia L Ochoa Medina

Craft Studio Furnishings (CSF) produces a unique line of cane furniture. The items currently on the market are table chairs, easy chairs, and love seats. The studio is considering introducing two new items: coffee tables and end tables. Management at CSF is seeking to optimize the daily production plan by means of a linear optimization model. The production of any item consists of three stages: manufacturing a wooden frame, stretching woven cane onto the frame, and finishing (e.g., painting, polishing). Each procedure is performed by a different shop within the studio. The labor hours required for each product are shown in the table below, along with the total number of daily labor hours available in each shop and the estimated net profit per item. In addition to the constraints mentioned above, CSF also wishes to limit the production of their new products until sufficient demand for these products is established. For the time being, they would like to produce no more than 10 coffee tables per day and no more than 10 end tables per day. Table Chair Easy Chair Love Seat Coffee Table End Table Availability (hours) Frame manufacturing (hours) 1 1 1.3 0.5 0.5 40 Stretching (hours) 1 1.2 1.5 2 1.5 80 Finishing (hours) 1 1.5 1.7 1 1 60 Profit ($/unit) 30 44 57 55 4

```r
library(lpSolve)
library(lpSolveAPI)

frame <- c(1,1,1,3,0.5,0.5,40)
sketch <- c(1, 1.2, 1.5, 2, 1.5, 80)
Finishing <- c(1, 1.5, 1.7, 1, 1, 60)
Profit <- c(30, 44, 57, 55, 4)
```

```r
m <- make.lp(nrow =0, ncol =5)
set.objfn(lprec = m, obj = c(30,44,57,55,45))
```

```r
lp.control(lprec = m, 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"
```

Add constraints

```
add.constraint(lprec =m,
               xt = c(1,1,1.3,0.5,0.5),
               type = "<=",
               rhs = 40)
print(m)
```

```
Model name: 
            C1    C2    C3    C4    C5          
Maximize    30    44    57    55    45          
R1           1     1   1.3   0.5   0.5  <=  40
Kind       Std   Std   Std   Std   Std          
Type      Real  Real  Real  Real  Real          
Upper      Inf   Inf   Inf   Inf   Inf          
Lower        0     0     0     0     0          
```

```
add.constraint(lprec =m,
               xt = c(1, 1.2, 1.5, 2, 1.5),
               type = "<=",
               rhs = 80)
print(m)
```

```
Model name: 
            C1    C2    C3    C4    C5         
Maximize    30    44    57    55    45         
R1           1     1   1.3   0.5   0.5  <=  40
R2           1   1.2   1.5     2   1.5  <=  80
Kind       Std   Std   Std   Std   Std         
Type      Real  Real  Real  Real  Real         
Upper      Inf   Inf   Inf   Inf   Inf         
Lower        0     0     0     0     0         
```

Finishing

```
add.constraint(lprec =m,
               xt = c(1, 1.5, 1.7, 1, 1),
               type = "<=",
               rhs = 60)
print(m)
```

```
Model name: 
            C1    C2    C3    C4    C5         
Maximize    30    44    57    55    45         
R1           1     1   1.3   0.5   0.5  <=  40
R2           1   1.2   1.5     2   1.5  <=  80
R3           1   1.5   1.7     1     1  <=  60
Kind       Std   Std   Std   Std   Std         
Type      Real  Real  Real  Real  Real         
Upper      Inf   Inf   Inf   Inf   Inf         
Lower        0     0     0     0     0         
```

```
print(m)
```

```
Model name: 
            C1    C2    C3    C4    C5         
Maximize    30    44    57    55    45         
R1           1     1   1.3   0.5   0.5  <=  40
R2           1   1.2   1.5     2   1.5  <=  80
```

```
R3            1    1.5    1.7      1      1   <=   60
Kind        Std    Std    Std    Std    Std
Type       Real   Real   Real   Real   Real
Upper       Inf    Inf    Inf    Inf    Inf
Lower         0      0      0      0      0
```

```
#Solves for the optimal solution. If R returns the code 0, this means an optimal exists and
solve(m)
```

```
[1] 0
```

```
#Returns the optimal values of the decision variables. R will print these values in the same
get.variables(m)
```

```
[1]  0.00000  0.00000 21.05263 24.21053  0.00000
```

```
#Returns the optimized value of the objective function.
get.objective(m)
```

```
[1] 2531.579
```

```
#returns the objective coefficient range.
get.sensitivity.obj(m)
```

```
$objfrom
[1] -1.000000e+30 -1.000000e+30  5.550000e+01  5.428571e+01 -1.000000e+30

$objtill
[1] 35.78947 47.92105 93.50000 76.00000 45.39474
```

```
get.sensitivity.rhs(m) #returns the shadow prices for each constraint.
```

```
$duals
[1]  0.0000000 19.2105263 16.5789474 -5.7894737 -3.9210526  0.0000000  0.0000000
[8] -0.3947368

$dualsfrom
[1] -1.000000e+30  7.777778e+01  4.000000e+01 -1.000000e+30 -2.985075e+00
[6] -1.000000e+30 -1.000000e+30 -4.444444e+00
```

```
$dualstill
[1] 1.000000e+30 1.200000e+02 6.054054e+01 2.000000e+00 2.222222e+01
[6] 1.000000e+30 1.000000e+30 4.380952e+01
```