

## QuantModelling: Assignment

#Title - Linear Programming with R #Name - Surbhi Khandelwal

For This Problem: Objective function min:  $+22 A1 + 14 A2 + 30 A3 + 600 A1 + 600 A2 + 600 A3 + 16 B1 + 20 B2 + 24 B3 + 625 B1 + 625 B2 + 625 B3$ ;

(Cost of Shipping per product + cost of production for each product)

Constraints: W1Demand:  $+A1 + B1 = 80$ ; W2Demand:  $+A2 + B2 = 60$ ; W3Demand:  $+A3 + B3 = 70$ ; ASupply:  $+A1 + A2 + A3 \leq 100$ ; BSupply:  $+B1 + B2 + B3 \leq 120$ ;

Where: A1 - Production at Plant A and being shipped to Warehouse 1 A2 - Production at Plant A and being shipped to Warehouse 2 A3 - Production at Plant A and being shipped to Warehouse 3 B1 - Production at Plant B and being shipped to Warehouse 1 B2 - Production at Plant B and being shipped to Warehouse 2 B3 - Production at Plant B and being shipped to Warehouse 3

```
library(lpSolve)
library(lpSolveAPI)
#install.packages('tinytex')
#tinytex::install_tinytex()
y <- read.lp("Ass6.lp")
y
```

Model name:

|          | A1   | A2   | A3   | B1   | B2   | B3   |    |     |
|----------|------|------|------|------|------|------|----|-----|
| Minimize | 622  | 614  | 630  | 641  | 645  | 649  |    |     |
| W1Demand | 1    | 0    | 0    | 1    | 0    | 0    | =  | 80  |
| W2Demand | 0    | 1    | 0    | 0    | 1    | 0    | =  | 60  |
| W3Demand | 0    | 0    | 1    | 0    | 0    | 1    | =  | 70  |
| ASupply  | 1    | 1    | 1    | 0    | 0    | 0    | <= | 100 |
| BSupply  | 0    | 0    | 0    | 1    | 1    | 1    | <= | 120 |
| Kind     | Std  | Std  | Std  | Std  | Std  | Std  |    |     |
| Type     | Real | Real | Real | Real | Real | Real |    |     |
| Upper    | Inf  | Inf  | Inf  | Inf  | Inf  | Inf  |    |     |
| Lower    | 0    | 0    | 0    | 0    | 0    | 0    |    |     |

Solving the problem to get objective function and do sensitivity and dual analysis.

```
solve(y)
```

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

```
get.objective(y)
```

```
## [1] 132790
```

#Our Objective function is: 132790

```
get.variables(y)
```

```
## [1] 0 60 40 80 0 30
```

```
#What this shows is: #A1 - Production at Plant A and being shipped to Warehouse 1 Should be 0
```

```
#A2 - Production at Plant A and being shipped to Warehouse 2 should be 60 units
```

```
#A3 - Production at Plant A and being shipped to Warehouse 3 should be 40 units
```

```
#B1 - Production at Plant B and being shipped to Warehouse 1 should be 80 units
```

```
#B2 - Production at Plant B and being shipped to Warehouse 2 should be 0
```

```
#B3 - Production at Plant B and being shipped to Warehouse 3 should be 30 units
```

```
#Now let's do the sensitivity analysis
```

```
get.constraints(y)
```

```
## [1] 80 60 70 100 110
```

```
get.sensitivity.objex(y)
```

```
## $objfrom
```

```
## [1] 6.220000e+02 -1.000000e+30 6.180000e+02 -8.756744e+16 6.330000e+02
```

```
## [6] 6.490000e+02
```

```
##
```

```
## $objtill
```

```
## [1] 1.00e+30 6.26e+02 6.30e+02 6.41e+02 1.00e+30 6.61e+02
```

```
##
```

```
## $objfromvalue
```

```
## [1] 4e+01 -1e+30 -1e+30 -1e+30 3e+01 -1e+30
```

```
##
```

```
## $objtillvalue
```

```
## [1] NA NA NA NA NA NA
```

```
get.sensitivity.rhs(y)
```

```
## $duals
```

```
## [1] 641 633 649 -19 0 0 0 0 0 12 0
```

```
##
```

```
## $dualsfrom
```

```
## [1] 0e+00 3e+01 4e+01 9e+01 -1e+30 -3e+01 -1e+30 -1e+30 -1e+30 -4e+01
```

```
## [11] -1e+30
```

```
##
```

```
## $dualstill
```

```
## [1] 9.0e+01 7.0e+01 8.0e+01 1.3e+02 1.0e+30 4.0e+01 1.0e+30 1.0e+30 1.0e+30
```

```
## [10] 3.0e+01 1.0e+30
```