QMM bpalazzo_8

Brandon Palazzo

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```
library(Benchmarking)
```

```
## Warning: package 'Benchmarking' was built under R version 4.0.3
```

```
## Loading required package: lpSolveAPI
```

```
## Loading required package: ucminf
```

```
## Warning: package 'ucminf' was built under R version 4.0.3
```

```
## Loading required package: quadprog
```

```
## Warning: package 'quadprog' was built under R version 4.0.3
```

```
data <- read.csv("QMMbpalazzo_8.csv")
```

Creating Table

```
x <- matrix(c(150, 400, 320, 520, 350, 320, 0.2, 0.7, 1.2, 2.0, 1.2, 0.7), ncol = 2)
y <- matrix(c(14000, 14000, 42000, 28000, 19000, 14000, 3500, 21000, 10500, 42000, 25000, 15000), ncol =
colnames(x) <- c("Daily Staff Hours","Daily Supplies")
colnames(y) <- c("Reimbursed Patient-Days","Privately Paid Patient-Days")
x
```

```
##      Daily Staff Hours Daily Supplies
## [1,]               150            0.2
## [2,]               400            0.7
## [3,]               320            1.2
## [4,]               520            2.0
## [5,]               350            1.2
## [6,]               320            0.7
```

```
y
```

```
##      Reimbursed Patient-Days Privately Paid Patient-Days
## [1,]                   14000                        3500
## [2,]                   14000                       21000
## [3,]                   42000                       10500
## [4,]                   28000                       42000
## [5,]                   19000                       25000
## [6,]                   14000                       15000
```

DEA analysis

```
e <- dea(x,y,RTS = "crs")
e
```

```
## [1] 1.0000 1.0000 1.0000 1.0000 0.9775 0.8675
```

Peers

```
peers(e)
```

```
##      peer1 peer2 peer3
## [1,]     1    NA    NA
## [2,]     2    NA    NA
## [3,]     3    NA    NA
## [4,]     4    NA    NA
## [5,]     1     2     4
## [6,]     1     2     4
```

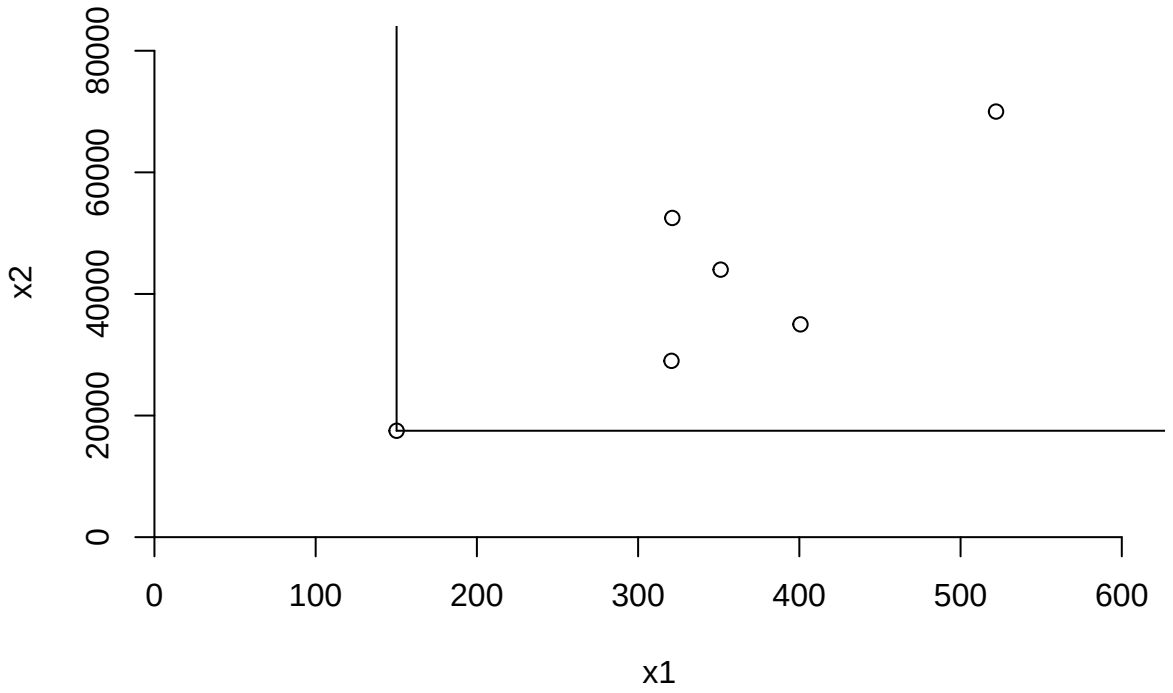
Lamdas

```
lambda(e)
```

```
##             L1         L2 L3        L4
## [1,] 1.0000000 0.00000000  0 0.0000000
## [2,] 0.0000000 1.00000000  0 0.0000000
## [3,] 0.0000000 0.00000000  1 0.0000000
## [4,] 0.0000000 0.00000000  0 1.0000000
## [5,] 0.2000000 0.08048142  0 0.5383307
## [6,] 0.3428571 0.39499264  0 0.1310751
```

Plot

```
dea.plot.isoquant(x,y,RTS="crs")
```



Comparing and Contrasting the Complete Table

```
data
```

```
##       ï..DMU Daily.Staff.Hours Daily.Supplies Reimbursed.Patient.Days
## 1 Facility 1               150            0.2                   14000
## 2 Facility 2               400            0.7                   14000
## 3 Facility 3               320            1.2                   42000
## 4 Facility 4               520            2.0                   28000
## 5 Facility 5               350            1.2                   19000
## 6 Facility 6               320            0.7                   14000
##   Privately.Paid.Patient.Days Efficiency Peers.1 Peers.2 Peers.3  Lambda.1
## 1                        3500     1.0000       1      NA      NA 1.0000000
## 2                       21000     1.0000       2      NA      NA 0.0000000
## 3                       10500     1.0000       3      NA      NA 0.0000000
## 4                       42000     1.0000       4      NA      NA 0.0000000
## 5                       25000     0.9775       1       2       4 0.2000000
## 6                       15000     0.8675       1       2       4 0.3428571
##     Lambda.2 Lambda.3  Lambda.4
## 1 0.00000000        0 0.0000000
## 2 1.00000000        0 0.0000000
## 3 0.00000000        1 0.0000000
## 4 0.00000000        0 1.0000000
## 5 0.08048142        0 0.5383307
## 6 0.39499264        0 0.1310751
```

```r
drs <- dea(x,y,RTS = "drs")
fdh <- dea(x,y,RTS = "fdh")

vrs <- dea(x,y,RTS = "vrs")
irs <- dea(x,y,RTS = "irs")

drs
```

```
## [1] 1.0000 1.0000 1.0000 1.0000 0.9775 0.8675
```

```r
fdh
```

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

```r
vrs
```

```
## [1] 1.0000 1.0000 1.0000 1.0000 1.0000 0.8963
```

```r
irs
```

```
## [1] 1.0000 1.0000 1.0000 1.0000 1.0000 0.8963
```

```r
e
```

```
## [1] 1.0000 1.0000 1.0000 1.0000 0.9775 0.8675
```

```r
z <- matrix(c(1, 1, 1, 1, 0.9775, 0.8675, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0.8963, 1, 1, 1, 1, 1, 0.896

colnames(z) <- c("DRS","FDH", "VRS", "IRS", "CRS")

z
```

```
##         DRS FDH    VRS    IRS    CRS
## [1,] 1.0000   1 1.0000 1.0000 1.0000
## [2,] 1.0000   1 1.0000 1.0000 1.0000
## [3,] 1.0000   1 1.0000 1.0000 1.0000
## [4,] 1.0000   1 1.0000 1.0000 1.0000
## [5,] 0.9775   1 1.0000 1.0000 0.9775
## [6,] 0.8675   1 0.8963 0.8963 0.8675
```

```r
full_table <- cbind(data, z)

full_table
```

```
##       ï..DMU Daily.Staff.Hours Daily.Supplies Reimbursed.Patient.Days
## 1 Facility 1               150            0.2                    14000
## 2 Facility 2               400            0.7                    14000
## 3 Facility 3               320            1.2                    42000
## 4 Facility 4               520            2.0                    28000
## 5 Facility 5               350            1.2                    19000
```

```
## 6 Facility 6               320            0.7                   14000
##   Privately.Paid.Patient.Days Efficiency Peers.1 Peers.2 Peers.3  Lambda.1
## 1                        3500     1.0000       1      NA      NA 1.0000000
## 2                       21000     1.0000       2      NA      NA 0.0000000
## 3                       10500     1.0000       3      NA      NA 0.0000000
## 4                       42000     1.0000       4      NA      NA 0.0000000
## 5                       25000     0.9775       1       2       4 0.2000000
## 6                       15000     0.8675       1       2       4 0.3428571
##     Lambda.2 Lambda.3  Lambda.4    DRS FDH    VRS    IRS    CRS
## 1 0.00000000        0 0.0000000 1.0000   1 1.0000 1.0000 1.0000
## 2 1.00000000        0 0.0000000 1.0000   1 1.0000 1.0000 1.0000
## 3 0.00000000        1 0.0000000 1.0000   1 1.0000 1.0000 1.0000
## 4 0.00000000        0 1.0000000 1.0000   1 1.0000 1.0000 1.0000
## 5 0.08048142        0 0.5383307 0.9775   1 1.0000 1.0000 0.9775
## 6 0.39499264        0 0.1310751 0.8675   1 0.8963 0.8963 0.8675
```

The DRS and CRS columns are the same and VRS and IRS columns are the same as well. The FDH column is unique because all facilities are fully efficient at 1. Facility 5 is fully efficient in FDH, VRS, and IRS, but slightly inefficient at DRS and CRS at 0.9775. Facility 6 is fully efficient at FDH, less efficient at VRS and IRS at 0.8963, and even less efficient at DRS and CRS at 0.8675. Facilities 1-4 are fully efficient throughout all DRS, FDH, VRS, IRS, and CRS.