Assignment 5 module 9

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This document contains the code for all examples in the Goal Programming module

Dewright Co.

Solve

Remarks

Applying the simplex method to this formulation gives the optimal solution with y1m = 0, y2p = 8.33, y2m = 0, y3p = 0, x1 = 8.33, x2 = 0, x3 = 1.67, y1p = 0, y3m = 0. can be The solutions are given in the order the variables appear in the formulation. This means that y1 = 0 and y3 = 0. So the 1st and his 3rd target are fully met, but the hiring target is exceeded by 8.33 (833 employees). The penalty for exceeding the target result is 16.67. # Preemptive Goal Programming - Sequential Approach ## Dewright Co. - First Stage

In the face of unsavory recommendations to increase the company's workforce by more than 20 percent, management revisited the original problem statement summarized in the previous table. Since this workforce increase is likely to be temporary, the very high cost of training 833 new recruits has been largely wasted, leading to massive layoffs (a well-known certainly) makes it difficult for companies to attract highly skilled employees in the country. future. For this reason, management concluded that avoiding an increase in the workforce should be given a very high priority. In addition, management recognizes that it will be very difficult for him to raise capital expenditures above $55 million for new products, so avoiding capital expenditures beyond that level is also very difficult. must have higher priority. ### Formulation and Solution The solution is Z = 0, x1 = 8 and y3m = 15. Now that we have the optimal solution, we can proceed to the second stage of optimization by setting y2p and y3p = 0 in the second stage formulation. ## Dewright Co. - Second Stage The best solution is unique and doesn't require any further goals, so we can stop here. The final solution is x1 = 5, x2 = 0, x3 = 3.75. This solution fully meets both the first priority goal and one of the second priority goals (no unemployment) and can only achieve the other second priority goal (long-term profit >= 125) by 8.75. # Dewright Co. - Streamlined Approach This solution is truly a two-step process. The first priority goal is met and the optimal solution falls short of the second priority goal in terms of long-term benefits.

Make maximum progress towards all goals

- Goal programming requires goal setting for all goals. What if some goals are open?
- Open targets have no minimum target (default). Therefore, we want to advance all goals at the same time.
- So a good goal is to maximize the minimum progress towards all goals. **1. Express y1+ and y1-; y2+ and y2-; P using x1, x2, x3**

$$y_1^+ - y_1^- = 50 - 6x1 - 4x2 - 5x3;$$

$$y_2^+ - y_2^- = 75 - 8x1 - 7x2 - 5x3;$$

$$P = 20x_1 + 15x_2 + 25x_3;$$

2. Express management objective function

$$Max \;\; Z = 20x_1 + 15x_2 + 25x_3 - 6y_1^+ - 6y_1^- - 3y_2^-$$

3. Formulate and solve LP

```
library(lpSolveAPI)
gp_sl <- read.lp("C:/Users/MEGHANA/Desktop/emax.lp")
gp_sl
```

```
## Model name:
##             X1    X2    X3   Y1P   Y1M   Y2M   Y2P
## Maximize    20    15    25    -6    -6    -3     0
## R1           6     4     5    -1     1     0     0  =  50
## R2           8     7     5     0     0     1    -1  =  75
## Kind       Std   Std   Std   Std   Std   Std   Std
## Type      Real  Real  Real  Real  Real  Real  Real
## Upper      Inf   Inf   Inf   Inf   Inf   Inf   Inf
## Lower        0     0     0     0     0     0     0
```

```
solve(gp_sl)
```

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

```
get.objective(gp_sl)
```

```
## [1] 225
```

```
get.variables(gp_sl)
```

```
## [1]  0  0 15 25  0  0  0
```

Conclusion
Z =225 mil d, x1=x2=0, x3=15, y1p=25, y1m=y2m=y2p=0.Profit is 25*15= 325 mil d. Employment is 7500 which has 2500 employees more than the goal so y1p=25, y1m=0. Earnings next year is 75 millions of dollars which is the same with the goal so y2m=y2p=0.