

Assignment 20 - DoCplex

July 2, 2019

1 Assignment 20 - DoCplex

1.0.1 Problem

Suppose that - in the product mix problem of assignment #19 - workers can be moved from one department to another.

Model the new problem and solve it with DoCplex.

Does the profit increase? What is the best allocation of workers between the two departments? What is the new optimal product mix?

1.0.2 Resolution

Differently from the previous assignment we must consider the hour per plant like variables X_3 , X_4 and X_5 . We can find the following situation to optimize:

$$\text{Max : } Z = 3X_1 + 5X_2$$

s.t.

$$X_3 + X_4 + X_5 = 400$$

$$X_1 \leq X_3$$

$$2X_2 \leq X_4$$

$$3X_1 + 2X_2 \leq X_5$$

So we make the following implementation with DoCplex:

```
In [5]: from docplex.mp.model import Model

mdl = Model(name="Products")

nbProd1 = mdl.integer_var(name="nbProd1")
nbProd2 = mdl.integer_var(name="nbProd2")
nbHours1 = mdl.integer_var(name="nbHours1")
nbHours2 = mdl.integer_var(name="nbHours2")
nbHours3 = mdl.integer_var(name="nbHours3")

mdl.add_constraint( nbHours1 + nbHours2 + nbHours3 == 400, "hours")
mdl.add_constraint( nbProd1 <= nbHours1, "Plant1")
```

```

mdl.add_constraint( 2*nbProd2 <= nbHours2, "Plant2")
mdl.add_constraint( 3*nbProd1 + 2*nbProd2 <= nbHours3, "Plant3")

mdl.maximize(3*nbProd1 + 5*nbProd2)

mdl.parameters.threads = 4
mdl.solve(log_output=False)

print("The optimal values obtained are:")
print("Product 1:", nbProd1.solution_value)
print("Product 2:", nbProd2.solution_value)
print("Workers plant 1:", nbHours1.solution_value)
print("Workers plant 2:", nbHours2.solution_value)
print("Workers plant 3:", nbHours3.solution_value)

```

The optimal values obtained are:

Product 1: 1.0

Product 2: 99.0

Workers plant 1: 1.0

Workers plant 2: 198.0

Workers plant 3: 201.0