Modeling with Linear Programming

Based on: www.INFORMS.org & Taha, H. A. 2017. Operations Research: An Introduction. 10th Edition. Boston, MA: Pearson

Andrés D. González

Assistant Professor

School of Industrial and Systems Engineering, The University of Oklahoma

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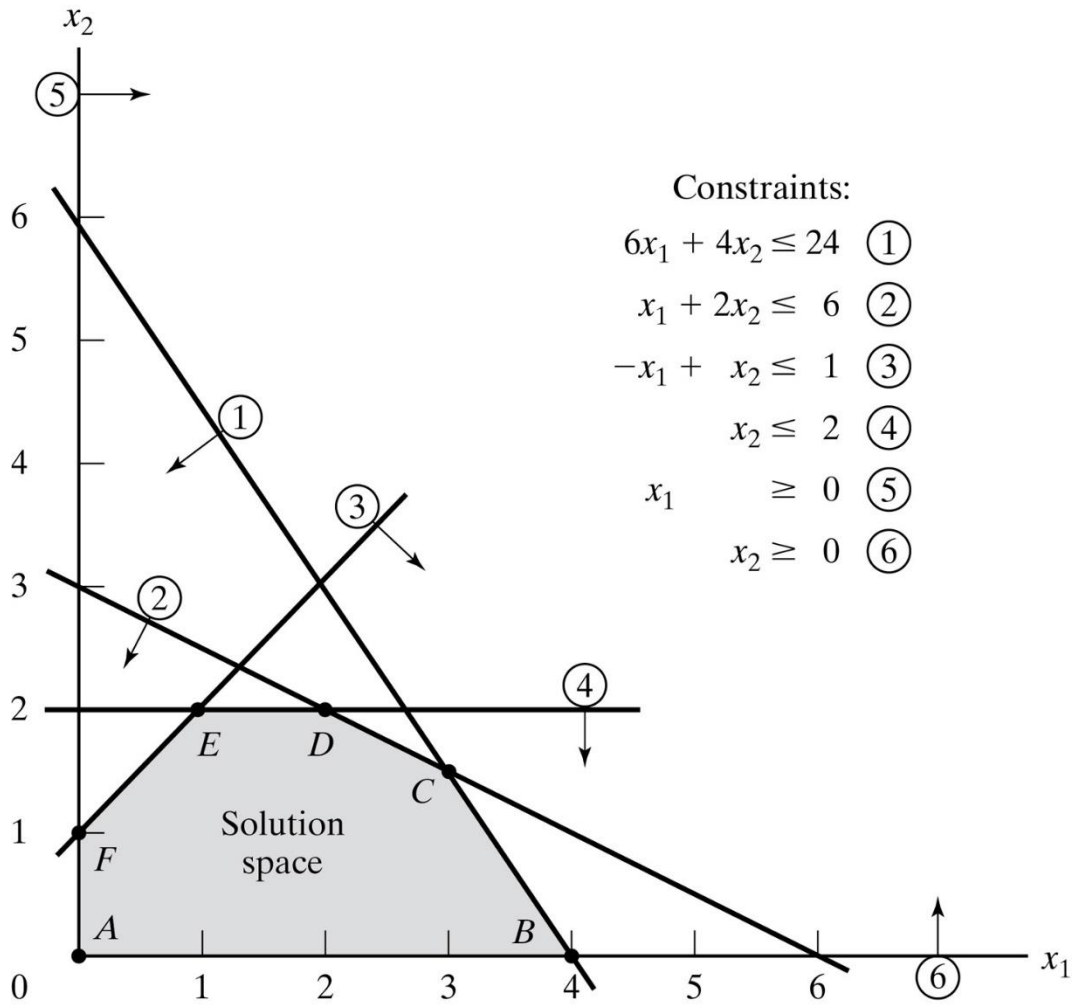
The University of Oklahoma, Norman, OK, USA

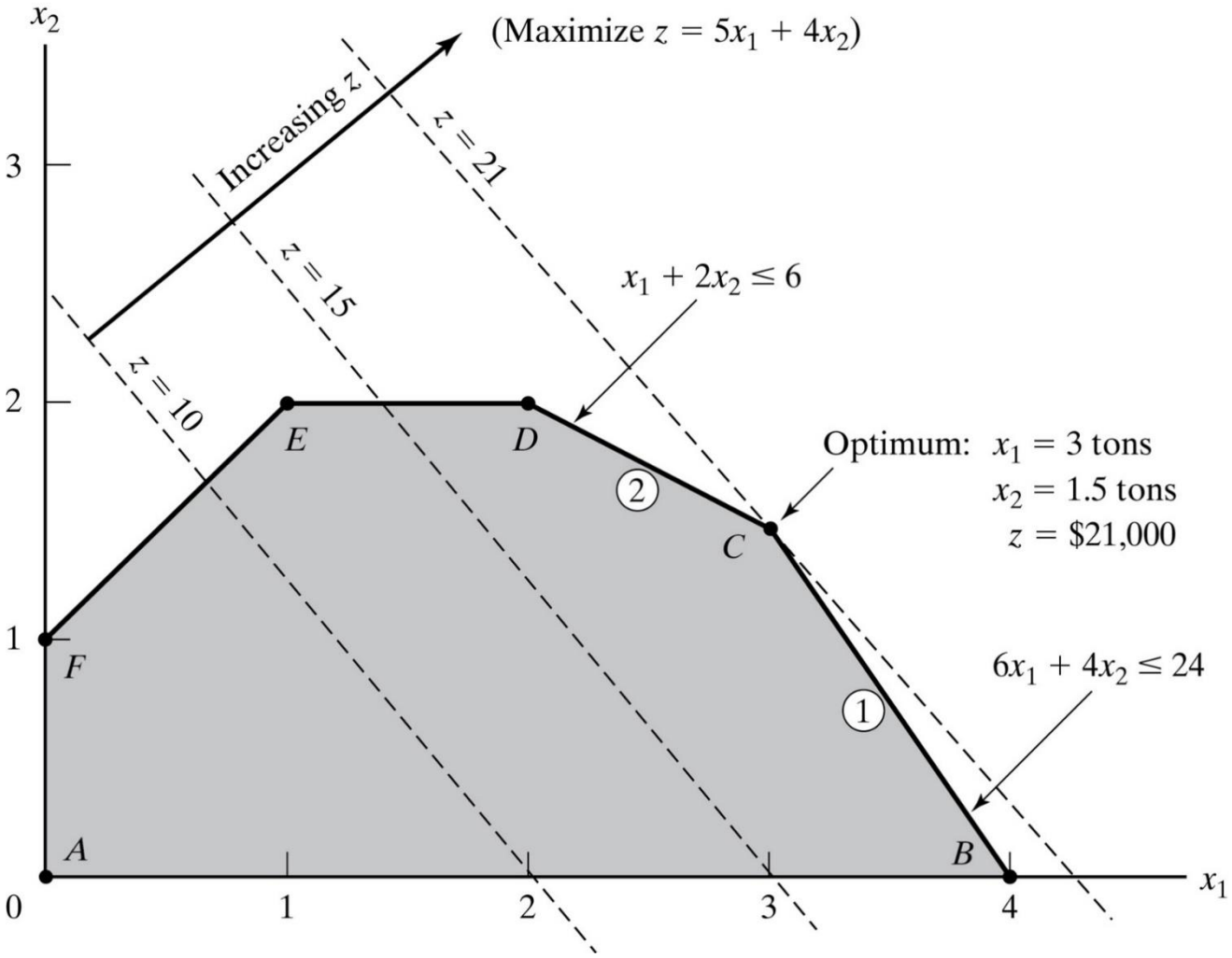
Feasible Space of the Reddy Mikks Model



Constraints:

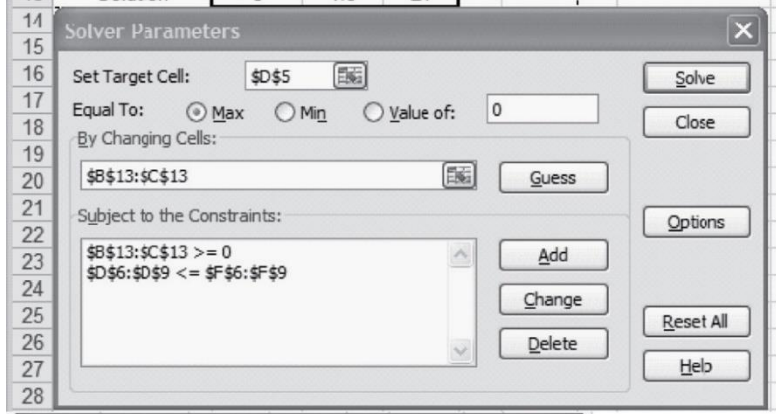
$$6x_1 + 4x_2 \leq 24 \quad (1)$$
$$x_1 + 2x_2 \leq 6 \quad (2)$$
$$-x_1 + x_2 \leq 1 \quad (3)$$
$$x_2 \leq 2 \quad (4)$$
$$x_1 \geq 0 \quad (5)$$
$$x_2 \geq 0 \quad (6)$$

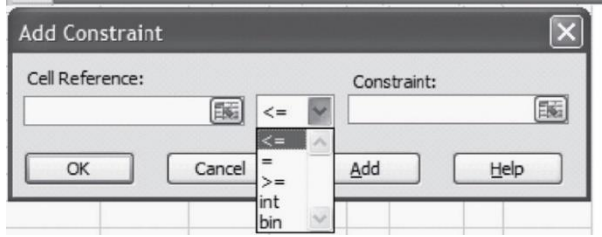
Optimum Solution of the Reddy Mikks Model



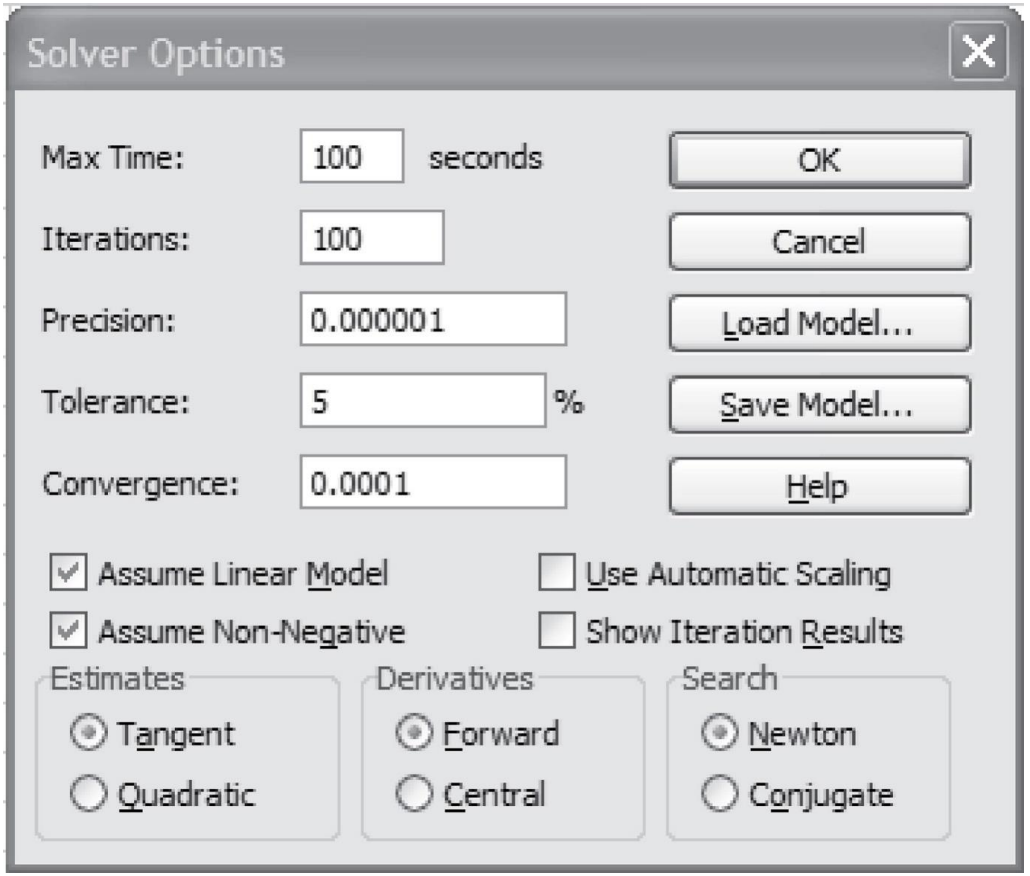
Solving of the Reddy Mikks Model in Excel (Solver)

	A	B	C	D	E	F	G	H	I	J
1	Reddy Mikks Model									
2	Input data:						Cell	Formula		Copy to
3		x1	x2				D5	=B5*B$13+C5*C$13		D6:D9
4		Exterior	Interior	Totals		Limits	D13	=D5		
5	Objective	5	4	21						
6	Raw material 1	6	4	24	<=	24				
7	Raw material 2	1	2	6	<=	6				
8	Market limit	-1	1	-1.5	<=	1				
9	Demand limit	0	1	1.5	<=	2				
10		>=0	>=0							
11	Output results:									
12		x1	x2	z						
13	Solution	3	1.5	21						





Solving of the Reddy Mikks Model in Excel (Solver)



Solving of the Reddy Mikks Model in Python (Gurobi)

```python
#Import gurobi and name model
from gurobipy import *
model=Model("Reddy_Mikks_Company")

#Define decision variables
x1={}
x1=model.addVar(vtype=GRB.CONTINUOUS, lb=0, ub=GRB.INFINITY)

x2={}
x2=model.addVar(vtype=GRB.CONTINUOUS, lb=0, ub=GRB.INFINITY)

#Define objective function
z=5*x1+4*x2
model.setObjective(z)
model.modelSense=GRB.MAXIMIZE
model.update()

#Add constraints
model.addConstr(6*x1+4*x2<=24)
model.addConstr(x1+2*x2<=6)
model.addConstr((-1)*x1+x2<=1)
model.addConstr(x2<=2)

model.update()

#Solve the model
model.optimize()

#printing outputs
if model.status==GRB.OPTIMAL:
    print ("\n Optimal value (profit in USD thousands):", model.objVal)
    print ("--- Production quantities---")
    print ("x1", x1.x)
    print ("x2", x2.x)
```

```
Gurobi Optimizer version 9.0.3 build v9.0.3rc0 (win64)
Optimize a model with 4 rows, 2 columns and 7 nonzeros
Model fingerprint: 0x5633e080
Coefficient statistics:
  Matrix range     [1e+00, 6e+00]
  Objective range  [4e+00, 5e+00]
  Bounds range     [0e+00, 0e+00]
  RHS range        [1e+00, 2e+01]
Presolve removed 1 rows and 0 columns
Presolve time: 0.01s
Presolved: 3 rows, 2 columns, 6 nonzeros

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    2.4000000e+01   1.200000e+01   0.000000e+00      0s
       3    2.1000000e+01   0.000000e+00   0.000000e+00      0s

Solved in 3 iterations and 0.01 seconds
Optimal objective  2.100000000e+01

 Optimal value (profit in USD thousands): 21.0
--- Production quantities---
x1 3.0
x2 1.5
```

THANK YOU

QUESTIONS?

Andrés D. González | andres.gonzalez@ou.edu