Uncertainty Week 2: Making Best Decisions in Settings with Low

- A resource allocation example: Zooter Industries
- Converting a verbal problem description into an algebraic model: decisions, objective, constraints
- From an algebraic model to a spreadsheet implementation: optimizing with Excel Solver
- Matching demand and supply across space: Keystone Dry Goods Logistics

A Complete Model Zooter Resource Allocation Problem:

Maximize 150*R +160*N

subject to

$$4*R + 5*N \le 5610$$

(frame manufacturing hours)

$$1.5*R + 2.0*N \le 2200$$

 $1.0*R + 0.8*N \le 1200$

(QA and packaging hours)

(wheel and deck manufacturing hours)

$$R$$
, N = integer

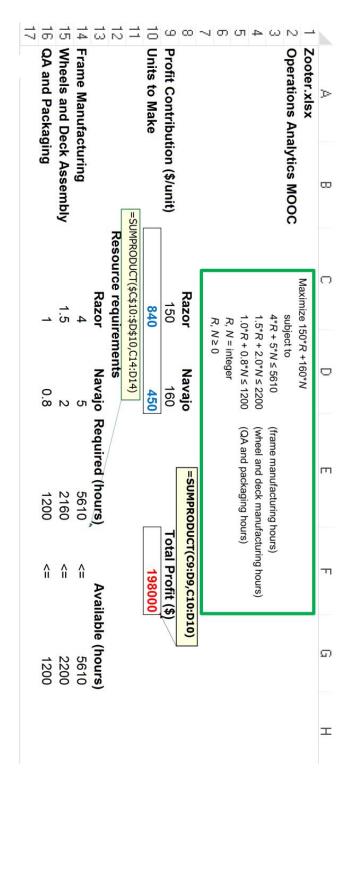
R, *N* ≥ 0

We will use Solver to "optimize" this model, i.e., to find the best combination of values for decision variables R and N

Solver Optimizer on Various Platforms

- Likely to be a part of standard Excel installation on Windows
- On Mac (see https://support.microsoft.com/en-us/kb/2431349)
- Included on Excel 2016 for Mac
- Included starting with Excel for Mac 2011 Service Pack 1 (version 14.1.0).
- Not included with Excel for Mac 2008, but can be downloaded from http://www.solver.com/solver-2008-mac
- Google Sheets: available as "add-on"

Spreadsheet Solution:



- Zooter.xlsx: a file containing the spreadsheet solution with added comments that express formulas we used
- According to Solver, the best decision is to produce 840 Razors and 450 Navajos in the coming week
- This decision will result in the weekly profit of \$198000

Optimization Concepts

Solution: a particular choice of values for the decision variables

◆ Feasible Solution:

- satisfies all constraints
- R=500, N=500 is feasible
- R=500, N=750 is infeasible

Objective Function Value (OFV):

- value of objective function for a solution
- OFV = \$155000 for R=500, N=500

Optimal Solution:

- feasible solution whose OFV cannot be improved upon
- R=840, N=450 is optimal for the Zooter mode
- in general, there may be more than one optimal solution