



Commerce Mentorship Program

COMM 290

Midterm Review Session

2014

Summary

- Basic Terminology
- Linear Programming
 - Components
 - Calculations
 - Applications

Basic Terminology

- Quantitative Decision Making
 - To find the optimal solution by maximizing or minimizing a variable (e.g. Profit via ↓Costs or ↑Revenue)
- Constraints
- Input Data
- Decision Variables
- Output

Solver

- Target Cell → Objective Output (max/min/#)
- Changing Cells → Decision Variables
- Constraints → Formulate limitations and requirements using (\leq , \geq =)
- Options → Assume linear model and non-negative

Linear Programming Components

- Feasible Solutions
 - All possible solutions given the constraints
 - No feasible solution if unbounded or if there are too many constraints
- Multiple Optima
 - Occurs when the objective function has the same slope as one of the constraints
- Algebraic Models
 - Know how to set up mathematically and graphically by finding intercepts and slopes

Sensitivity Report I

- Reduced Cost is the amount that the Objective Coefficient must change by for the resource to be part of the optimal solution
- The Objective Coefficient is the amount that the decision variable contributes to the Target
- Allowable Increase/Decrease for Decision variables indicates the range in which the Objective Coefficient can move and not change the optimal solution

31 Sensitivity Report							
32							
33 Adjustable Cells							
34	Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
35	\$C\$18	Make Frame	3,462	0	40	7.52632	1E+30
36	\$D\$18	Make Support	0	5	12	1E+30	5.5
37	\$E\$18	Make Strap	5,000	0	7	2	7
38	\$C\$19	Buy Frame	1,538	0	53	1E+30	7.52631579
39	\$D\$19	Buy Support	15,000	0	16	5.5	16
40	\$E\$19	Buy Strap	0	2	9	1E+30	2
41							
42							
43	Constraints						
44	Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
45	\$F\$7	Cutting Used	16961.538	0	18000	1E+30	1038.46154
46	\$F\$8	Milling Used	9000	-5	9000	750	9000
47	\$F\$9	shaping Used	18576.923	0	21000	1E+30	2423.07692
48	\$C\$20	Supply Frame	5,000	53	5000	1E+30	1538.46154
49	\$D\$20	Supply Support	15,000	16	15000	1E+30	15000
50	\$E\$20	Supply Strap	5,000	7	5000	1153.85	5000
51							

Sensitivity Report I.1

- Shadow Price is the effect on the Target for each additional unit of the constraint

(Zero for non-binding constraints)

- Allowable Increase/Decrease for Constraints indicates the range in which the constraint can move without changing the Shadow Price

(Infinity for non-binding constraints)

31 Sensitivity Report							
32							
33 Adjustable Cells							
34	Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
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51							

Linear Programming Components

- Properties:
 - Proportionality
 - Variables are multiplied by a constant factor
 - Any changes are proportionate
 - Additivity
 - Sum of X's contribution is equal total X's contribution
 - Divisibility
 - Can be in whole numbers or fractions

Calculations

- Reduced Costs: Allowable \uparrow and \downarrow
 - Set an inequality of the slopes of the objective and the intersecting constraint lines for a specific variable
- Shadow Prices:
 - Increase constraint's constant by 1 at an intersection
 - Solve for variables and plug into the objective line
 - Find the difference between original objective value and "new" objective value
- Shadow Prices: Allowable \uparrow and \downarrow
 - The difference between the values of the constraint line using initial intersecting coordinates and the next nearest intersection's

Applications

- Mixed Product Combinations
 - Selling goods A, B, and C
- Aggregate Planning Models
 - Scheduling
- Product Blending Models
 - $A + B = C$
- Transportation Models
 - From Point A to Point B with C amount of goods