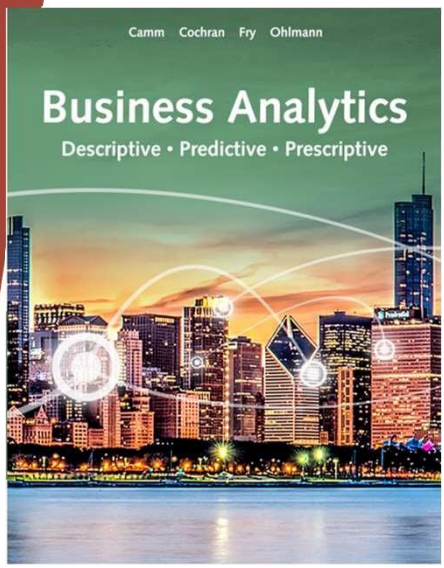


Business Analytics

Chapter 10 – Some Useful Functions for Modeling

HAMLINE UNIVERSITY SCHOOL OF BUSINESS

Introduction

- Procter & Gamble
  - Fortune 500 consumer good company
  - Excellence in Business Analytics
- Must maintain inventory around the world.
  - Not enough?
  - Too much?
- Solution: Spreadsheet Models
  - When and how much inventory to order

70% of P & G companies use these models
10% reduction in inventory
= $350 million in savings

Introduction

- What-if Analysis (Using Spreadsheet Models)
  - Provide easy-to-use, sophisticated mathematical and logical functions.
  - Allow for easy instantaneous recalculation for a change in model inputs.
  - Are fairly easy to use.
  - The most used business analytics tool.
- Answer Questions Like:
  - If the per unit cost is $4 what is the impact on profit?
- May help you with your final projects!

Spread Sheet Models or What-If Analysis Tools

Data Tables

Goal Seek

Scenario Manager

What-If Analysis

- **Data Tables:**
  - Excel tool which quantifies the impact of changing the value of a specific input on an output of interest.

One-way data table:
Summarizes a single input's impact on the output.

Two-way data table:
Summarizes two inputs' impact on the output.

What-If Analysis

Figure 10.4: The Input for Constructing a One-Way Data Table for Nowlin Plastics

	A	B	C	D	E	F	G
1	**Nowlin Plastics**						
2							
3	**Parameters**						
4	Manufacturing Fixed Cost	$234,000.00		Quantity	$219,000.00		
5	Manufacturing Variable Cost per Unit	$2.00		0			
6				25,000			
7	Outsourcing Cost per Unit	$3.50		50,000			
8				75,000			
9				100,000			
10	**Model**			125,000			
11	Quantity	10,000		150,000			
12				175,000			
13	Total Cost to Produce	$254,000.00		200,000			
14				225,000			
15	Total Cost to Outsource	$35,000.00		250,000			
16				275,000			
17	Savings due to Outsourcing	$219,000.00		300,000			
18							

What-If Analysis

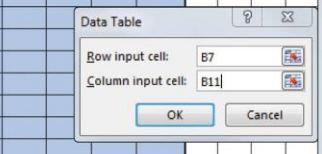
Figure 10.5 Results of One-Way Data Table for Nowlin Plastics

	A	B	C	D	E
1	**Nowlin Plastics**				
2					
3	**Parameters**				
4	Manufacturing Fixed Cost	$234,000.00		Quantity	$219,000.00
5	Manufacturing Variable Cost per Unit	$2.00		0	$234,000
6				25,000	$196,500
7	Outsourcing Cost per Unit	$3.50		50,000	$159,000
8				75,000	$121,500
9				100,000	$84,000
10	**Model**			125,000	$46,500
11	Quantity	10,000		150,000	$9,000
12				175,000	–$28,500
13	Total Cost to Produce	$254,000.00		200,000	–$66,000
14				225,000	–$103,500
15	Total Cost to Outsource	$35,000.00		250,000	–$141,000
16				275,000	–$178,500
17	Savings due to Outsourcing	$219,000.00		300,000	–$216,000
18					

What-If Analysis

Figure 10.6: The Input for Constructing a Two-Way Data table for Nowlin Plastics

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Nowlin Plastics**												
2													
3	**Parameters**												
4	Manufacturing Fixed Cost	$234,000.00		$219,000.00	$2.89	$3.13	$3.50	$3.54	$3.59				
5	Manufacturing Variable Cost per Unit	$2.00		0									
6				25,000									
7	Outsourcing Cost per Unit	$3.50		50,000									
8				75,000									
9				100,000									
10	**Model**			125,000									
11	Quantity	10,000		150,000									
12				175,000									
13	Total Cost to Produce	$254,000.00		200,000									
14				225,000									
15	Total Cost to Outsource	$35,000.00		250,000									
16				275,000									
17	Savings due to Outsourcing	$219,000.00		300,000									
18													
19													



What-If Analysis

Figure 10.7: Results of Two-Way Data Table for Nowlin Plastics

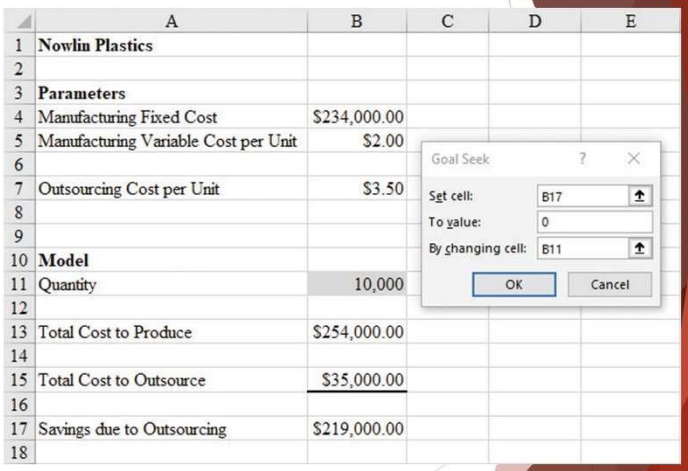
	A	B	C	D	E	F	G	H	I
1	**Nowlin Plastics**								
2									
3	**Parameters**								
4	Manufacturing Fixed Cost	$234,000.00		$219,000.00	$2.89	$3.13	$3.50	$3.54	$3.59
5	Manufacturing Variable Cost per Unit	$2.00		0	$234,000	$234,000	$234,000	$234,000	$234,000
6				25,000	$211,750	$205,750	$196,500	$195,500	$194,250
7	Outsourcing Cost per Unit	$3.50		50,000	$189,500	$177,500	$159,000	$157,000	$154,500
8				75,000	$167,250	$149,250	$121,500	$118,500	$114,750
9				100,000	$145,000	$121,000	$84,000	$80,000	$75,000
10	**Model**			125,000	$122,750	$92,750	$46,500	$41,500	$35,250
11	Quantity	10,000		150,000	$100,500	$64,500	$9,000	$3,000	–$4,500
12				175,000	$78,250	$36,250	–$28,500	–$35,500	–$44,250
13	Total Cost to Produce	$254,000.00		200,000	$56,000	$8,000	–$66,000	–$74,000	–$84,000
14				225,000	$33,750	–$20,250	–$103,500	–$112,500	–$123,750
15	Total Cost to Outsource	$35,000.00		250,000	$11,500	–$48,500	–$141,000	–$151,000	–$163,500
16				275,000	–$10,750	–$76,750	–$178,500	–$189,500	–$203,250
17	Savings due to Outsourcing	$219,000.00		300,000	–$33,000	–$105,000	–$216,000	–$228,000	–$243,000
18									

What-If Analysis

- **Goal Seek:**
  - Excel tool that allows the user to determine the value of an input cell that will cause the value of a related output cell to equal some specified value (the goal).
- In the case of Nowlin Plastics:
  - Suppose we want to know the value of the quantity of phone cases where it becomes more cost effective to manufacture rather than outsource.
  - Goal Seek will tell us!

What-If Analysis

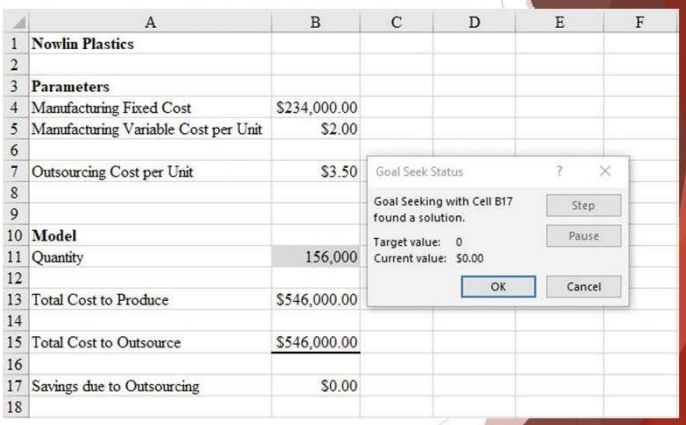
Figure 10.8: Goal Seek Dialog Box for Nowlin Plastics



	A	B	C	D	E
1	**Nowlin Plastics**				
2					
3	**Parameters**				
4	Manufacturing Fixed Cost	$234,000.00			
5	Manufacturing Variable Cost per Unit	$2.00			
6					
7	Outsourcing Cost per Unit	$3.50			
8					
9					
10	**Model**				
11	Quantity	10,000			
12					
13	Total Cost to Produce	$254,000.00			
14					
15	Total Cost to Outsource	$35,000.00			
16					
17	Savings due to Outsourcing	$219,000.00			
18					

What-If Analysis

Figure 10.9: Results from Goal Seek for Nowlin Plastics



	A	B	C	D	E	F
1	**Nowlin Plastics**					
2						
3	**Parameters**					
4	Manufacturing Fixed Cost	$234,000.00				
5	Manufacturing Variable Cost per Unit	$2.00				
6						
7	Outsourcing Cost per Unit	$3.50				
8						
9						
10	**Model**					
11	Quantity	156,000				
12						
13	Total Cost to Produce	$546,000.00				
14						
15	Total Cost to Outsource	$546,000.00				
16						
17	Savings due to Outsourcing	$0.00				
18						

What-If Analysis

- **Scenario Manager:**
  - Excel tool that quantifies the impact of changing multiple inputs on one or more outputs of interest.
- Scenario Manager extends the data table concept to cases:
  - When you are interested in changing more than two inputs
  - When you want to quantify the changes these inputs have on one or more outputs of interest.

Middletown Amusement Park

- Season Pass:
  - Annual Membership
  - No cost at gate
  - $15 per person on food etc.
- No Season Pass
  - $35 at gate
  - $45 per person on food etc.
- Cost of Operations $33,000
- Cost of goods = 50% price of good

Middletown Amusement Park

- Profit:
  - Dependent on Weather!
- Scenarios:
  - 1. Partly Cloudy
  - 2. Rain
  - 3. Sunny
- Inputs Effected
  - Number of people in the park
  - $ spent on food etc.
  - Cost of operations

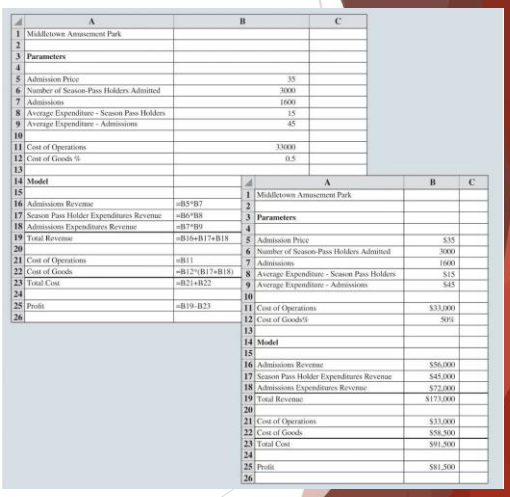
Middletown Amusement Park

Weather Scenarios for Middletown Amusement Park

	Scenarios		
	Partly Cloudy	Rain	Sunny
Season-pass Holders	3000	1200	8000
Admissions	1600	250	2400
Average Expenditure - Season-Pass Holders	$15	$10	$18
Average Expenditure - Admissions	$45	$20	$57
Cost of Operations	$33,000	$27,000	$37,000

What-If Analysis

Figure 10.10: Middletown Amusement Park Daily Profit Model



	A	B	C
1	Middletown Amusement Park		
2			
3	**Parameters**		
4			
5	Admission Price	35	
6	Number of Season-Pass Holders Admitted	3000	
7	Admissions	1600	
8	Average Expenditure - Season Pass Holders	15	
9	Average Expenditure - Admissions	45	
10			
11	Cost of Operations	33000	
12	Cost of Goods %	0.5	
13			
14	**Model**		
15			
16	Admissions Revenue	=B5*B7	
17	Season Pass Holder Expenditures Revenue	=B6*B8	
18	Admissions Expenditures Revenue	=B7*B9	
19	Total Revenue	=B16+B17+B18	
20			
21	Cost of Operations	=B11	
22	Cost of Goods	=B12*(B17+B18)	
23	Total Cost	=B21+B22	
24			
25	Profit	=B19-B23	
26			

	A	B	C
1	Middletown Amusement Park		
2			
3	**Parameters**		
4			
5	Admission Price	$35	
6	Number of Season-Pass Holders Admitted	3000	
7	Admissions	1600	
8	Average Expenditure - Season Pass Holders	$15	
9	Average Expenditure - Admissions	$45	
10			
11	Cost of Operations	$33,000	
12	Cost of Goods%	50%	
13			
14	**Model**		
15			
16	Admissions Revenue	$56,000	
17	Season Pass Holder Expenditures Revenue	$45,000	
18	Admissions Expenditures Revenue	$72,000	
19	Total Revenue	$173,000	
20			
21	Cost of Operations	$33,000	
22	Cost of Goods	$58,500	
23	Total Cost	$91,500	
24			
25	Profit	$81,500	
26			

What-If Analysis

Figure 10.11:
Scenario Manager Dialog Box

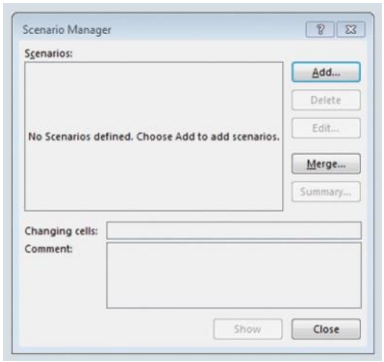
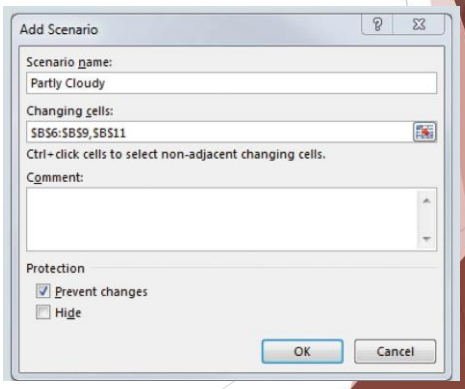


Figure 10.12:
Add Scenario Dialog Box



What-If Analysis

Figure 10.13:
Scenario Values Dialog Box

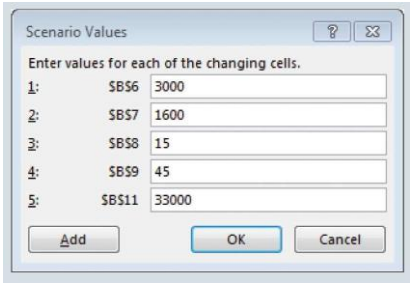
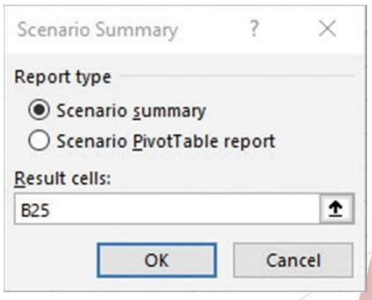


Figure 10.14:
Scenario Summary Dialog Box



What-If Analysis

Figure 10.15: Scenario Summary for Middletown Amusement Park

	Scenario Summary				
		Current Values:	Partly Cloudy	Rain	Sunny
	Changing Cells:				
	SBS6	3000	3000	1200	8000
	SBS7	1600	1600	250	2400
	SBS8	$15	$15	$10	$18
	SBS9	$45	$45	$45	$57
	SBS11	$33,000	$33,000	$27,000	$37,000
	Result Cells:				
	SBS25	$81,500	$81,500	–$6,625	$187,400

Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.