

Business Analytics

Chapter 10 - Some Useful Functions for Modeling



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:

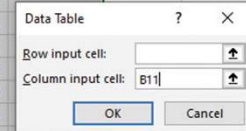
Summarizes two inputs' impact on the output.



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													

Data Table

Row input cell: B7

Column input cell: B11

OK Cancel

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					

Goal Seek

Set cell: B17

To value: 0

By changing cell: B11

OK Cancel

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						

Goal Seek Status

Goal Seeking with Cell B17 found a solution.

Target value: 0

Current value: \$0.00

OK Cancel

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 Effectuated
 - ▶ 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	1000	
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	1000	
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	\$35,000	
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

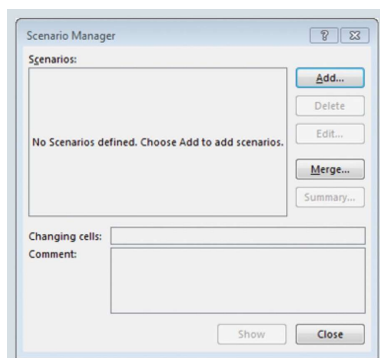
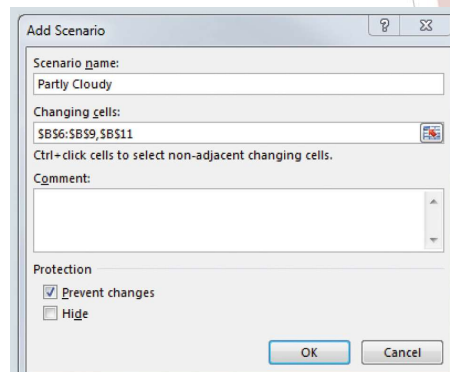
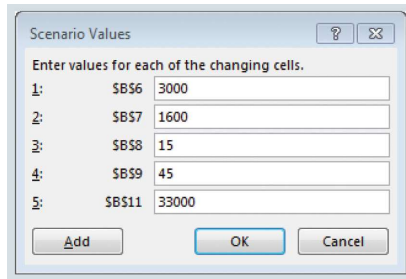


Figure 10.12:
Add Scenario Dialog Box



What-If Analysis

Figure 10.13:
Scenario Values Dialog Box



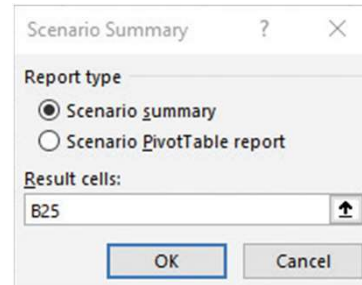
Scenario Values

Enter values for each of the changing cells.

1:	\$B\$6	3000
2:	\$B\$7	1600
3:	\$B\$8	15
4:	\$B\$9	45
5:	\$B\$11	33000

Buttons: Add, OK, Cancel

Figure 10.14:
Scenario Summary Dialog Box



Scenario Summary

Report type

☒ Scenario summary
☐ Scenario PivotTable report

Result cells:

B25

Buttons: OK, Cancel

What-If Analysis

Figure 10.15: Scenario Summary for Middletown Amusement Park

	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								

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.