

Engin 103  
Fall '06  
Meeting #8: Sept. 28, 2006

**How to obtain a model?** CW3 can be done by following these 7 steps. The process consists of using Solver (get it through Tools/Add-ins if needed) to minimize a “standard deviation” parameter  $s$  by allowing the polynomial coefficient to vary. After using Solver, the final values for  $a$ ,  $b$ ,  $c$  determines our quadratic model that represents our pendulum.

**Step 1**

1	A	B	C	D	E
1	Your name	10/14/2004			
2	X (Periods)	Y (lengths)	a, b, c guesses		
3	4.5	5	1	a	
4	6.35	10	0	b	
5	7.75	15	0	c	
6	9.2	20			
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

We are trying to relate X to Y using  $Y' = aX^2 + bX + c$

**Step 2**

1	A	B	C	D	E
1	Tomas Materney	10/14/2004			
2	X (Periods)	Y (lengths)	a, b, c guesses		
3	4.5	5	1		
4	6.35	10	0		
5	7.75	15	0		
6	9.2	20			
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					

In this column:  $Y' = aX^2 + bX + c$

(a) In this cell type  
 $=\$C\$3*A3^2 + \$C\$4*A3 + \$C\$5$   
 This gives  $Y'$  when X is in A3 using a quadratic function

(b) copy

**Step 3**

1	C	D	E	F	G	H
1	10/14/04					
2	a, b, c guesses	In this column: $aX^2 + bX + c$	In this column: $(Y - Y')^2$			
3	1	20.25	232.56			
4	0	40.3225	919.45401			
5	0	60.0625	2030.6289			
6	0	84.64	4178.3296			
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

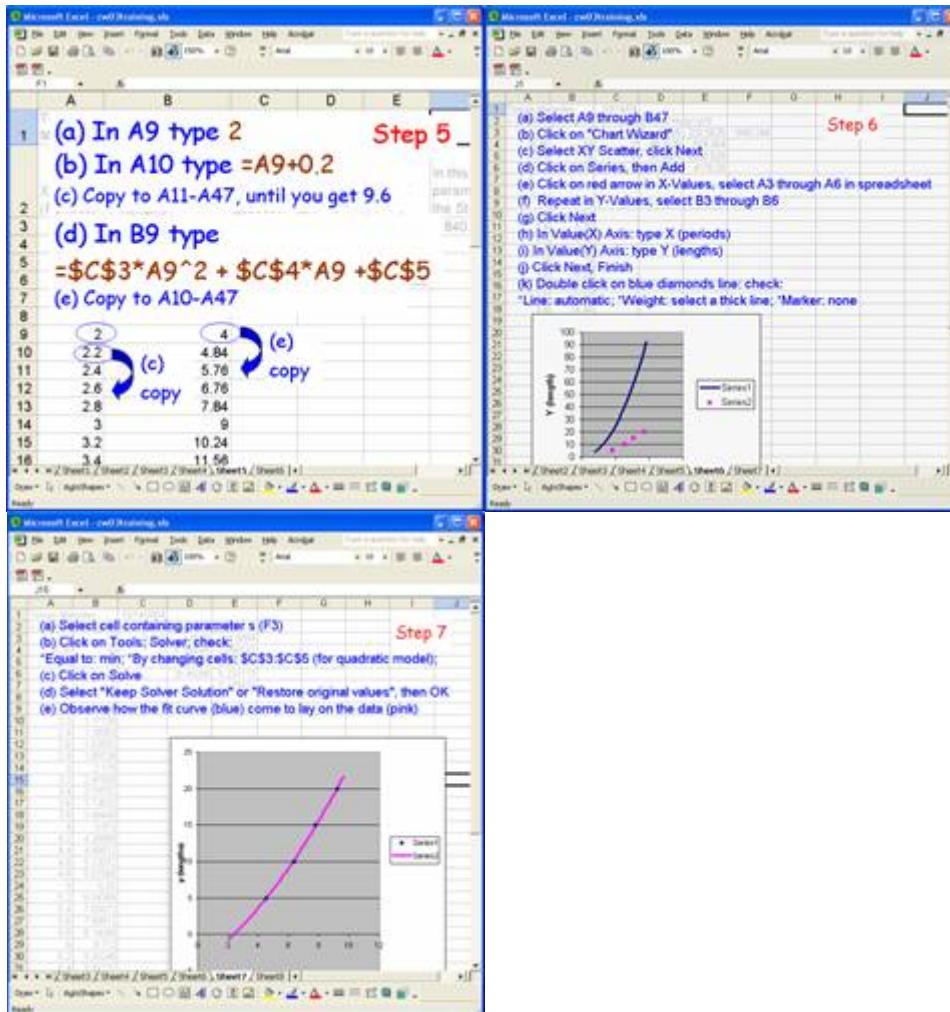
(a) In this cell type  
 $=(D3-B3)^2$   
 This gives the deviation between the model  $Y'$  and the data Y

(b) copy

**Step 4**

1	C	D	E	F	G	H
1	10/14/04					
2	a, b, c guesses	In this column: $aX^2 + bX + c$	In this column: $(Y - Y')$	In this cell: parameter s, the Std. Dev.		
3	1	20.25	232.56			
4	0	40.3225	919.454			
5	0	60.0625	2030.629			
6	0	84.64	4178.33			
7						
8						
9						
10						
11						
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14						
15						
16						

In this cell type  
 $=\text{average}(E3:E6)$   
 This gives the parameter s, the deviation between model  $Y'$  and data Y



Suggested items to write in the Engin 103 logbook:

- 1) Write in your own words what is a process of data modeling from start to finish, as done using Excel
- 2) What need to be done if you would like to change the model (quadratic) into a different one (for example: linear or cubic) to see if you can get a better one?