Linest Function (Mac) | ERC

The linest function is a useful tool in Excel to fit a line (y= mx + b) to the data in order to identify the relationship between two variables (x and y). In addition to the fitted value, the linest function also produces uncertainty estimates for the fitted values, which we could not get from the [trendline](#) function. The linest function uses the least square procedure which fits a line to a set of data points by minimizing the sum of the squares of the residuals of the points from the curve. Learn more about the [least square procedure](#).

Calculating Linest Function

First of all, let us enter the data for which you want to calculate the linest function. Type your data in two columns, one for the x variables and one for the y.

	A	B	C
1			
2			
3		x	y
4		2	2.3
5		3	4.5
6		4	6.7
7		5	9.8
8		6	12.3
9		7	15.4
10			
11			

Select the area that will hold the statistics of the fitted function. Unlike other Excel functions, the linest function has multiple outputs. Each output appears in a different cell. In order to see all of the outputs, you need to select the appropriate number of cells in the appropriate locations. You should draw the mouse to form a 5 row by 2 column area to hold the results, as shown below. (We will explain why and what each entry means) **You only need to form a 3 row by 2 column area.**

	A	B	C
1			
2			
3		x	y
4		2	2.3
5		3	4.5
6		4	6.7
7		5	9.8
8		6	12.3
9		7	15.4
10			
11			
12			
13			
14			
15			
16			
17			

Click Formulas in the Menu and select Insert at the very left. In the drop down list, select the category "Statistical". And from that category, scroll down and select function "LINEST".
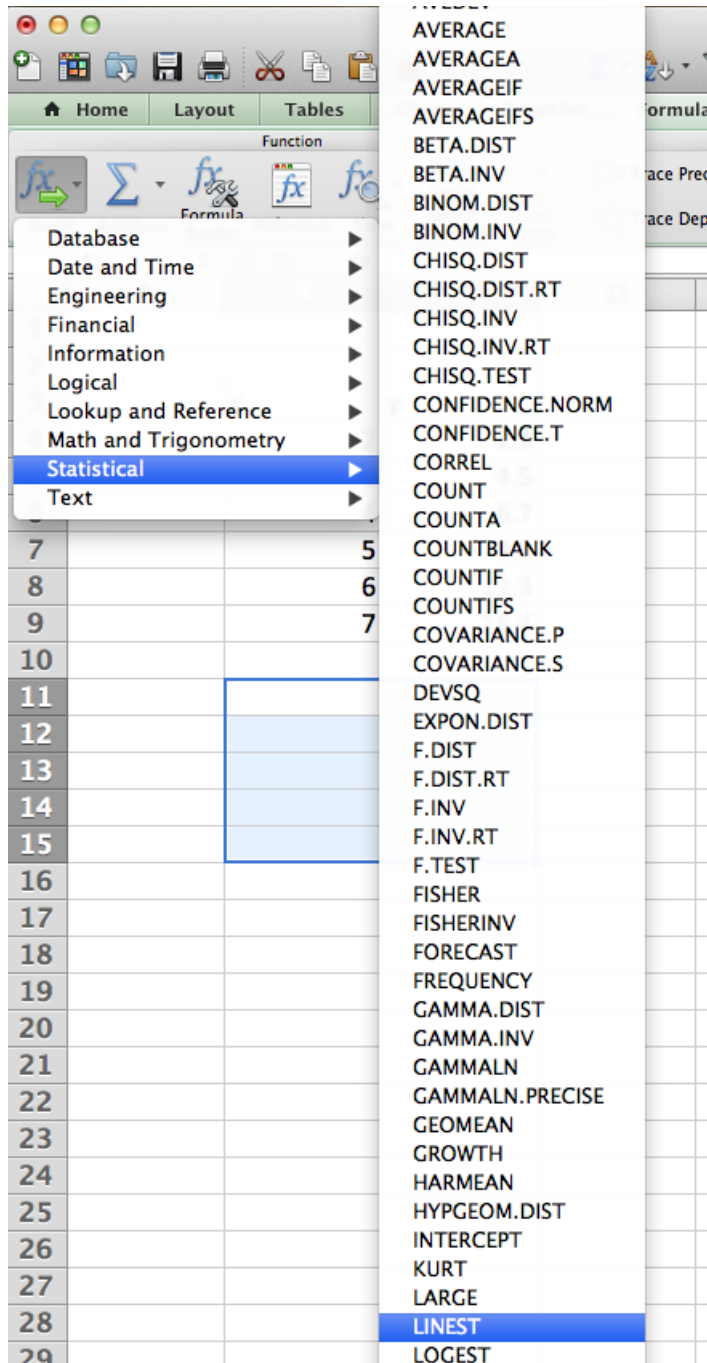
Click on OK and you will see the function with the prompts for what parameters to put in.

Select the y and x values you want to fit with the linest function and type in "True" for [const] and [stats]. The first True indicates that you wish the line to be in the form y=mx+b with a non-zero intercept. The second True specifies that you wish the error estimates to be listed. The four parameters need to be separated by commas. **NOTE THAT IF YOU CHOOSE THE THIRD ARGUMENT, const, TO BE FALSE INSTEAD OF TRUE YOU ARE FORCING THE Y-INTERCEPT TO BE ZERO.**

x	y
2	2.3
3	4.5
4	6.7
5	9.8
6	12.3
7	15.4

=LINEST()

LINEST(known_y's, [known_x's], [const], [stats])

LINEST   ⬍ ✕ ✓ ⟲ *fx*   =LINEST(C4:C9,B4:B9,true,true)

	A	B	C	D
1				
2				
3		x	y	
4		2	2.3	
5		3	4.5	
6		4	6.7	
7		5	9.8	
8		6	12.3	
9		7	15.4	
10				
11		=LINEST(C4:C9,B4:B9,true,true)		
12		LINEST(known_y's, [known_x's], [const], [stats])		
13				
14				
15				
16				

Then click Enter and you will see a number in the first box of your 5*2 matrix. This number is the coefficient m in the equation y=mx+b.

x	y
2	2.3
3	4.5
4	6.7
5	9.8
6	12.3
7	15.4

2.62857143

Get Least Square Results

The next step will give you the error estimates and other information of your linear model. Select the 5*2 matrix for holding the results. Then highlight the entire formula in the formula bar for the cell containing the coefficient (in this example 2.628571), including the equal sign. Hold down Command and press Return. You will then get the error estimates.

x	y
2	2.3
3	4.5
4	6.7
5	9.8
6	12.3
7	15.4
2.62857143	-3.3285714
0.084997	0.40910554
0.995835	0.35556796
956.384181	4
120.914286	0.50571429

THESE TWO ROWS ARE NOT NEEDED

Error estimates for slope and intercept are useful for analysis in a variety of subjects.

	A	B	C	D
1				
2				u_m is the standard uncertainty of slope (4-21)
3		x	y	u_b is the standard uncertainty of intercept (4-21)
4		2	2.3	s_y is the standard deviation of y (the fit) (4-19)
5		3	4.5	
6		4	6.7	
7		5	9.8	
8		6	12.3	
9		7	15.4	
10				
11	slope	m	2.62857143	-3.3285714 intercept	b
12	error	u_m	0.084997	0.40910554 error	u_b
13	R-squared	R^2	0.995835	0.35556796 standard deviation of y	s_y
14	F-statistic		956.384181	4 degrees of freedom	
15	regression sum of squares		120.914286	0.50571429 residual sum of squares	
16				
17				
18				

OMIT

Graphing Linest Function

The next step, after getting all the estimates, would be to graph the data points and the fitted line. Notice that the fitted line plotted from the linest function will be the same line as the linear trendline. If you do

not need the exact value of fitted y, you could skip the next step and simply add a trendline to the scatterplot of x and y.

We first calculate the fitted values. In the column after the y values, we created the fitted y values which are equal to x values * slope + intercept.

| LINEST				fx	=$C$11+B4*$B$11		
	A		B	C	D	
1						
2						
3			x	y	fitted y values	
4			2	2.3	=$C$11+B4*$B$11	
5			3	4.5		
6			4	6.7		
7			5	9.8		
8			6	12.3		
9			7	15.4		
10						
11	slope		2.62857143	-3.3285714	intercept	
12	error		0.084997	0.40910554	error	
13	R-squared		0.995835	0.35556796	standard deviation of y	
14	F-statistic		956.384181	4	degrees of freedom	OMIT
15	regression sum of squares		120.914286	0.50571429	residual sum of squares	
16						
17						

Since we are using the same slope (cell C11) and same intercept (cell B11) for all fitted values, we use absolute reference for the two cells. (Recall absolute reference here) Then we use auto fill to get all fitted y values. (Recall auto fill here)

| D4				fx	=$C$11+B4*$B$11	
	A		B	C	D	E
1						
2						
3			x	y	fitted y values	
4			2	2.3	1.928571429	
5			3	4.5	4.557142857	
6			4	6.7	7.185714286	
7			5	9.8	9.814285714	
8			6	12.3	12.44285714	
9			7	15.4	15.07142857	
10						
11	slope		2.62857143	-3.3285714	intercept	
12	error		0.084997	0.40910554	error	
13	R-squared		0.995835	0.35556796	standard deviation of y	
14	F-statistic		956.384181	4	degrees of freedom	OMIT
15	regression sum of squares		120.914286	0.50571429	residual sum of squares	
16						
17						

Now we have all information and we are ready to graph the results. Select the x, y and fitted y values and make a scatter plot first. (Recall how to create a chart here)
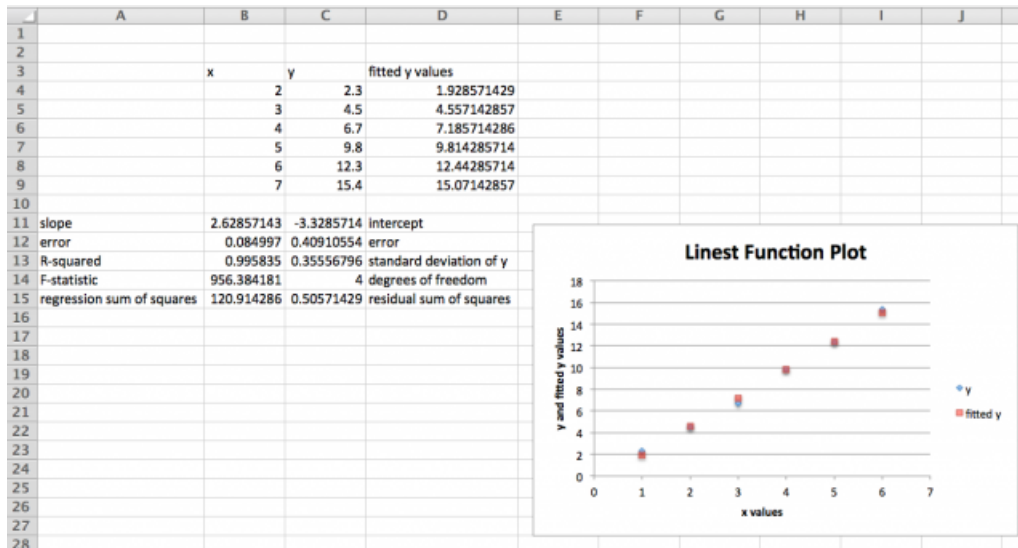
You can add titles, axis names and edit legend. (To get help editing charts) Then we replace the plotting symbols for the fitted y values with connecting lines. In order to do this, we double click on one of the fitted y value data points. The Format Data Series dialogue box will pop up. Change the marker type to none and line color to be solid line.
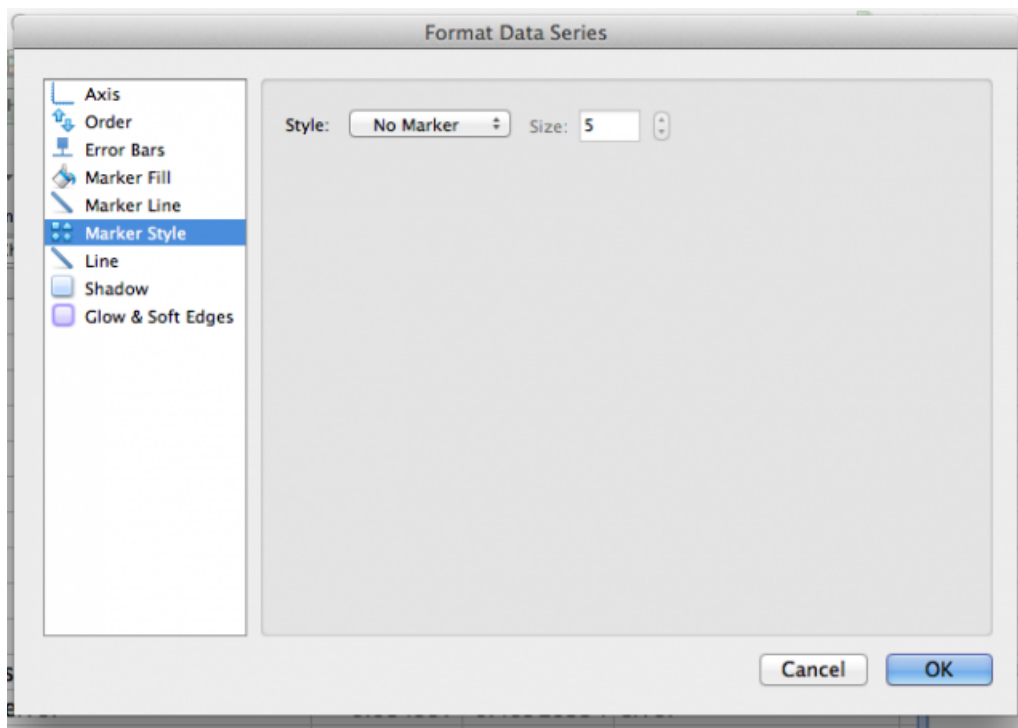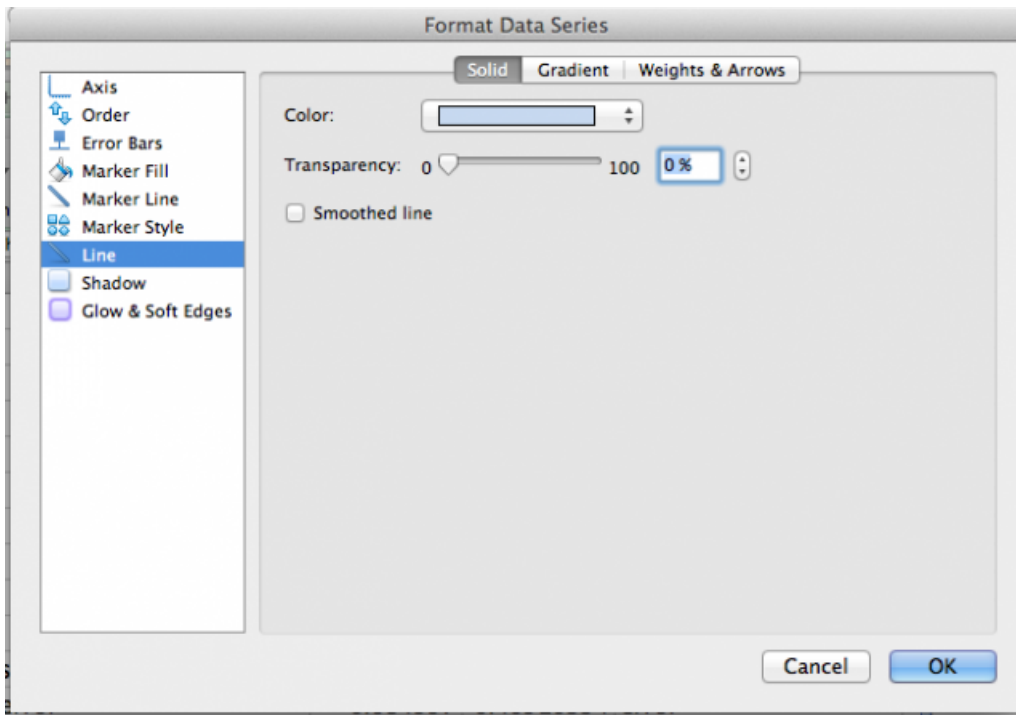
Click on OK, and you will get the plot with fitted y values connected by a line.