

# Excel: Using LINEST function, Plotting a graph, Adding Error Bars

Raghav K Chhetri

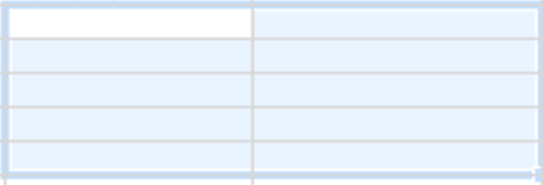
01/24/2009

# Using LINEST function

- Lets start with a table for time and velocity as shown on the right.
- LINEST function returns several outputs, so to begin with, select a 2 by 5 array as shown.

<b>time (m)</b>	<b>uncertainty in time</b>	<b>velocity (m/sec)</b>	<b>uncertainty in velocity</b>
2.5	0.1	5.5	0.3
3.7	0.3	7.7	0.2
4.9	0.2	9.8	0.7
6.9	0.4	12.3	0.9
8.3	0.6	15.7	0.2
11.5	0.9	16.2	0.3
13.3	0.8	17.2	0.6
17.9	0.3	18.9	0.6
20.3	0.6	25.3	0.9

**Using Linest function:**



NOTE: I mistakenly put (m) for the unit of time.

Under the Insert Tab, select Function. Then, make the selections as shown below. Hit OK.

The screenshot shows the Microsoft Excel interface with the 'Insert' tab selected. The 'Function Wizard' dialog box is open, showing the 'Statistical' category selected in the left pane and 'LINEST' selected in the right pane. The background spreadsheet contains a table of time and velocity data.

time (m)	uncertainty in time	velocity (m/sec)	uncertainty in velocity
2.5	0.1	5.5	
3.7	0.3	7.7	
4.9	0.2	9.8	
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20.3	0.6	25.3	

Using Linest function:  
=

**Paste Function**

Function category: Most Recently Used, All, Financial, Date & Time, Math & Trig, **Statistical**, Lookup & Reference, Database, Text, Logical, Information

Function name: GAMMALN, GEOMEAN, GROWTH, HARMEAN, HYPGEOMDIST, INTERCEPT, KURT, LARGE, **LINEST**, LOGEST, LOGINV

LINEST(known\_y's,known\_x's,const,stats)

Returns an array that describes a straight line that best fits your data, calculated by using the least squares method.

[Click for Help on the selected function.](#) Cancel OK

Select the y-values and x-values from the table.

**LINEST**

Known_y's	<input type="text" value="C4:C12"/>		= {5.5;7.7;9.8;12.3;1
Known_x's	<input type="text" value="A4:A12"/>		= {2.5;3.7;4.9;6.9;8.:
Const	<input type="text" value="TRUE"/>		= TRUE
Stats	<input type="text" value="TRUE"/>		= TRUE

= {0.93787618833324,4.98307

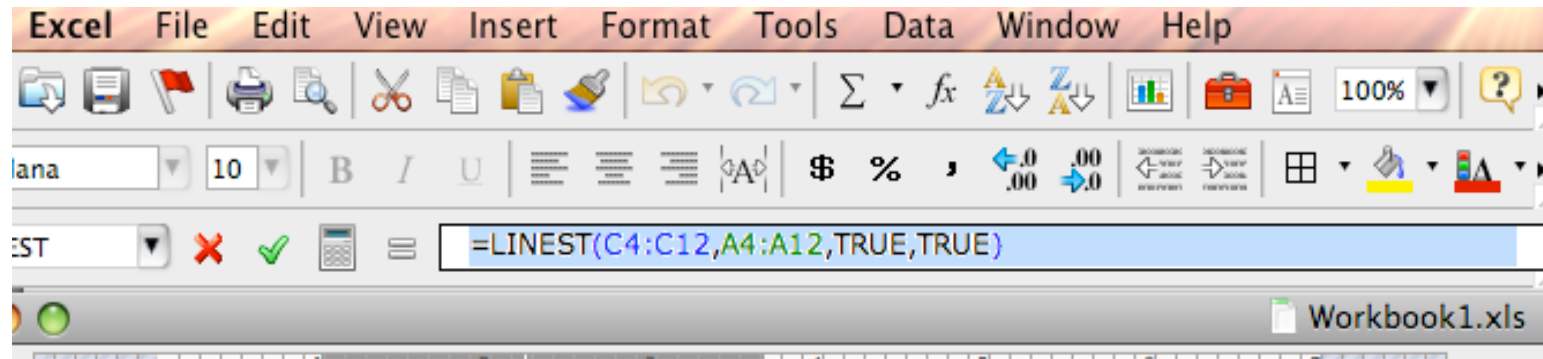
Returns an array that describes a straight line that best fits your data, calculated by using the least squares method.

Stats is a logical value: return additional regression statistics = TRUE; return m-coefficients and the constant b = FALSE or omitted.

Formula result = 0.937876188

Write 'TRUE' for the last two boxes. Hit OK.

Now, highlight the formula in the formula bar.



Press Ctrl+Shift simultaneously and hit Enter (Mac users, press Command and hit Enter)

# Linest Function

- The array we selected earlier is now filled with numbers as shown to the right
- Lets see what some of these numbers mean

<b>Table 1: Time and Velocity Data</b>			
<b>time (m)</b>	<b>uncertainty in time</b>	<b>velocity (m/sec)</b>	<b>uncertainty in velocity</b>
2.5	0.1	5.5	0.3
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17.9	0.3	18.9	0.6
20.3	0.6	25.3	0.9
<b>Using Linest function:</b>			
	0.937876188	4.983072931	
	0.102847501	1.188614381	
	0.922358443	1.828360018	
	83.15790383	7	
	277.9885864	23.4003025	

# Linest Function

<b>Table 1: Time and Velocity Data</b>			
<b>time (m)</b>	<b>uncertainty in time</b>	<b>velocity (m/sec)</b>	<b>uncertainty in velocity</b>
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17.9	0.3	18.9	0.6
20.3	0.6	25.3	0.9
<b>Using Linest function:</b>			
Slope	0.937876188	4.983072931	Y-intercept
Slope Uncertainty	0.102847501	1.188614381	y-intercept uncertainty
R <sup>2</sup> Value	0.922358443	1.828360018	
	83.15790383	7	
	277.9885864	23.4003025	
Thus,			
Acceleration (slope of velocity vs time curve) is:			0.9 +/- 0.1 m/sec <sup>2</sup>
Velocity at t=0 (y-intercept) is:			5 +/- 1 m/sec

# Plotting a graph

- Select the x-column first. Hold down the CTRL key and select the y-column next.
- Choose XY scatter, under subtype, select the first one as shown

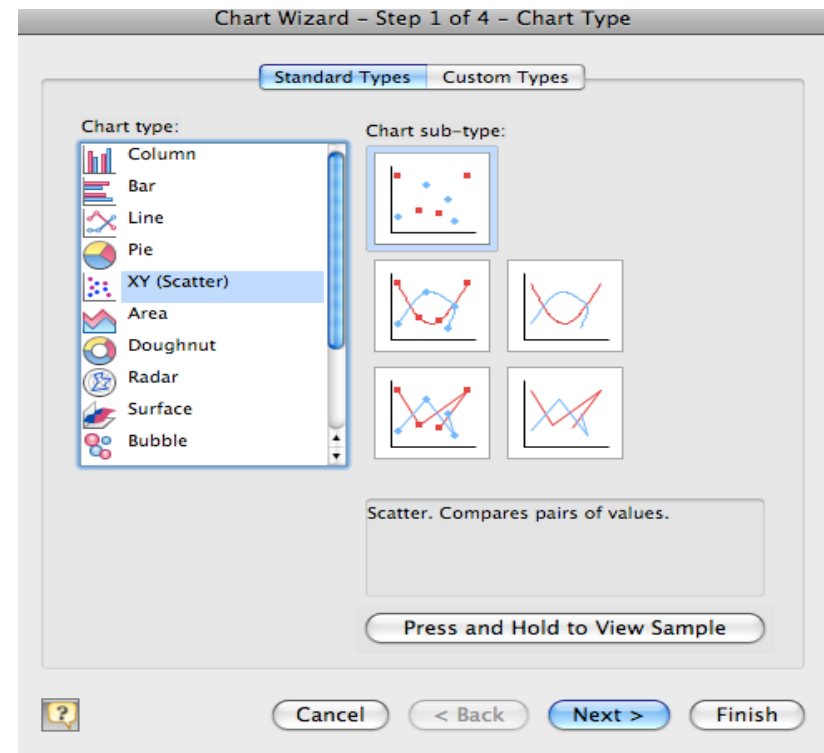
Table 1: Time and Velocity Data			
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Using Linest function:			
Slope	0.937876188	4.983072931	Y-intercept
Slope Uncertainty	0.102847501	1.188614381	y-intercept uncertainty
R^2 Value	0.922358443	1.828360018	
	83.15790383	7	
	277.9885864	23.4003025	

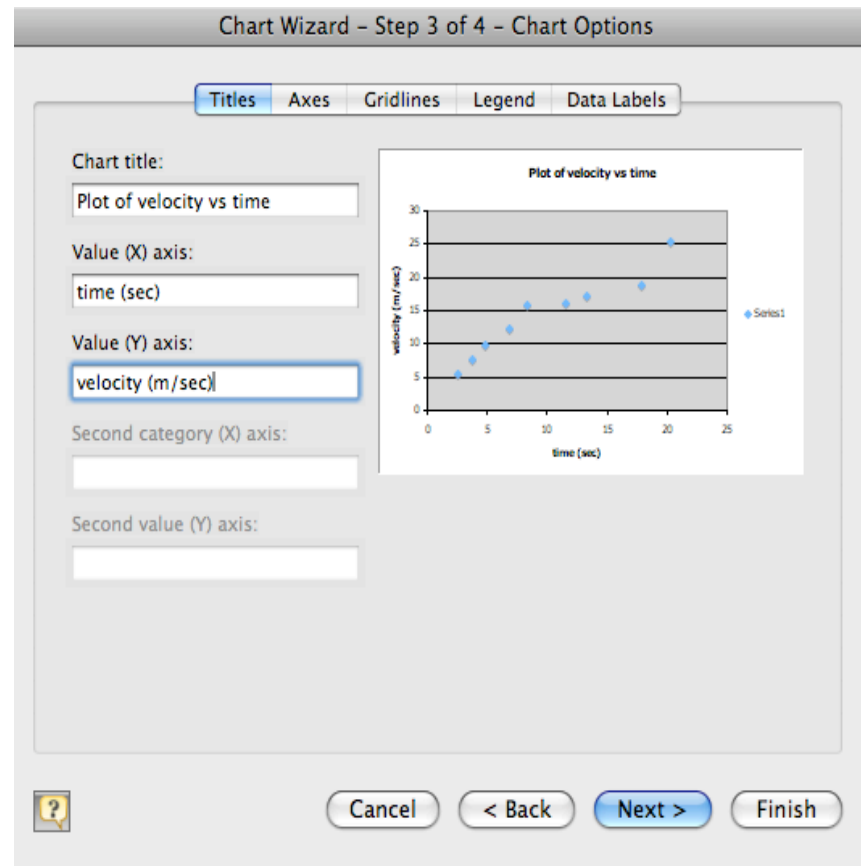
  

Thus,			
Acceleration (slope of velocity vs time curve) is:		0.9 +/- 0.1 m/sec^2	
Velocity at t=0 (y-intercept) is:		5 +/- 1 m/sec	

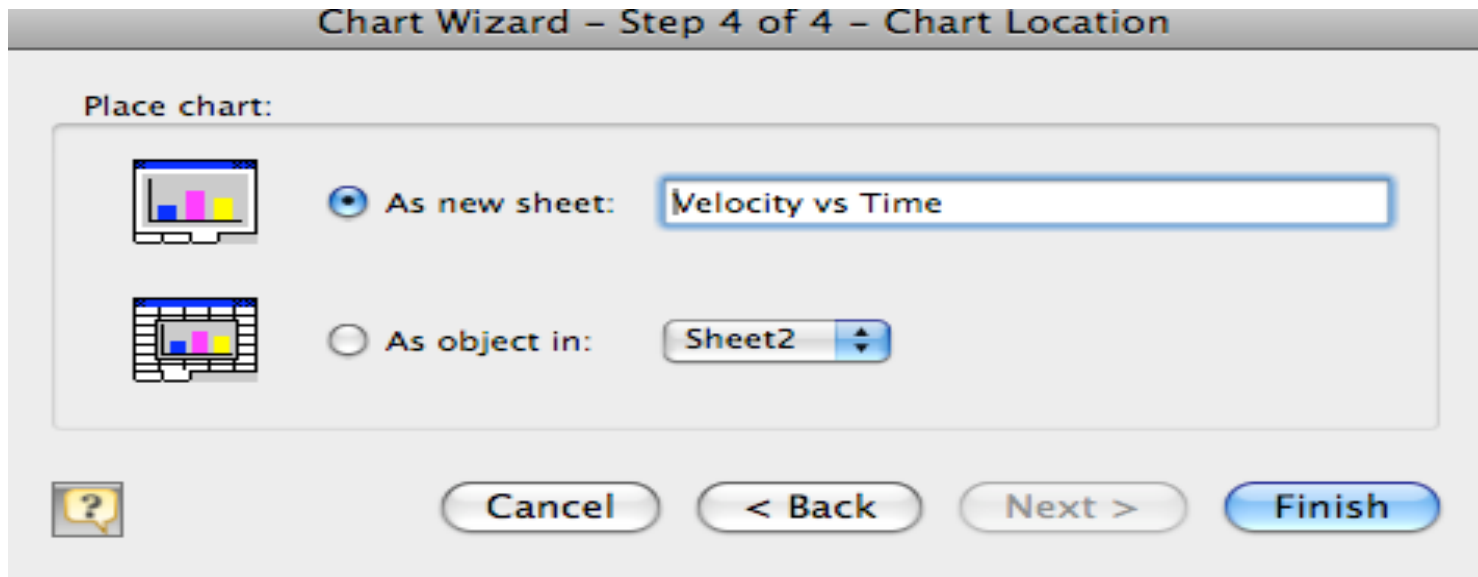


# Plotting a graph

- Give an appropriate title to the graph
- Label the axes (Don't forget the UNITS!!)

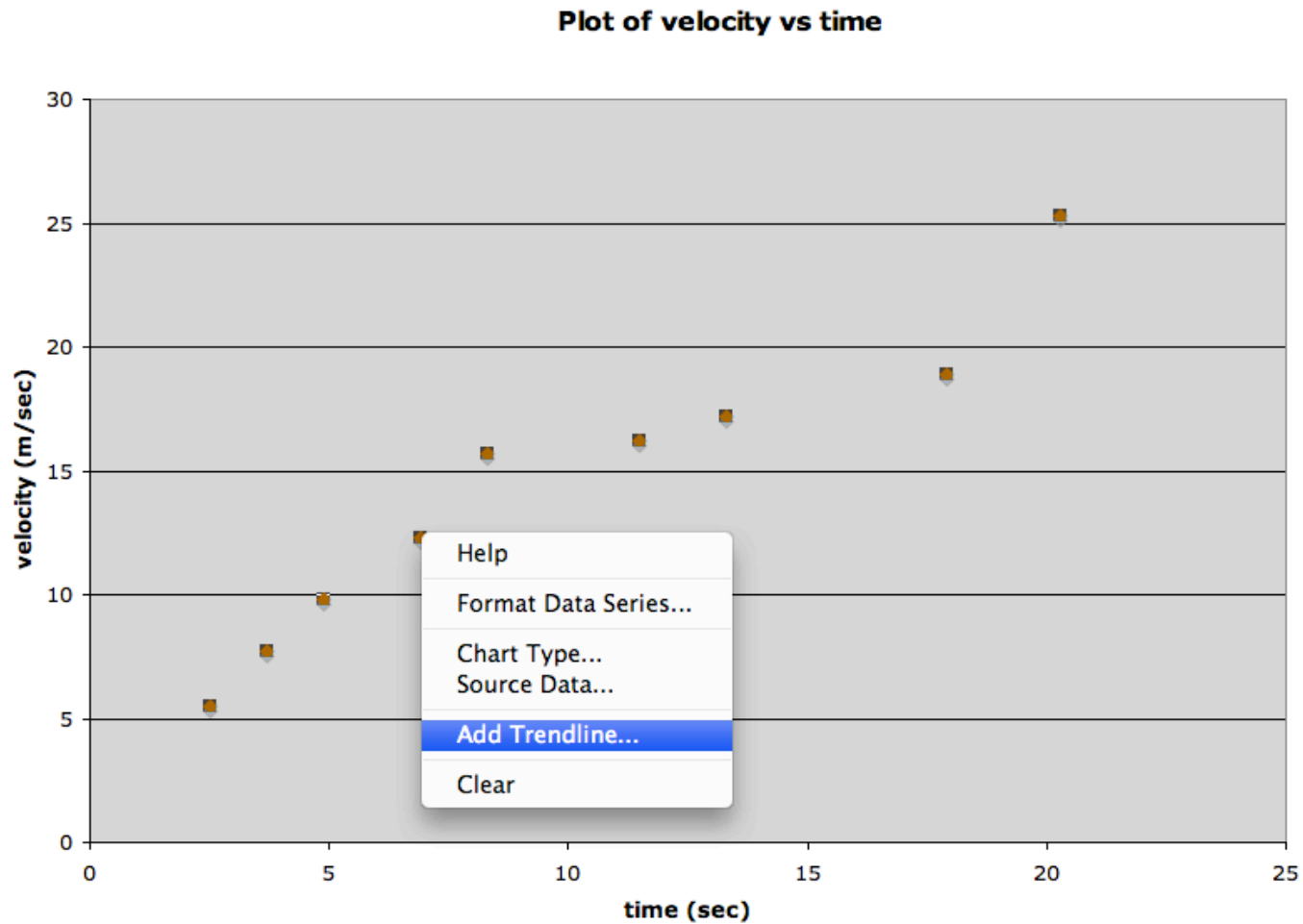


# Plotting a graph



- Select 'As new sheet'. Name the sheet appropriately.

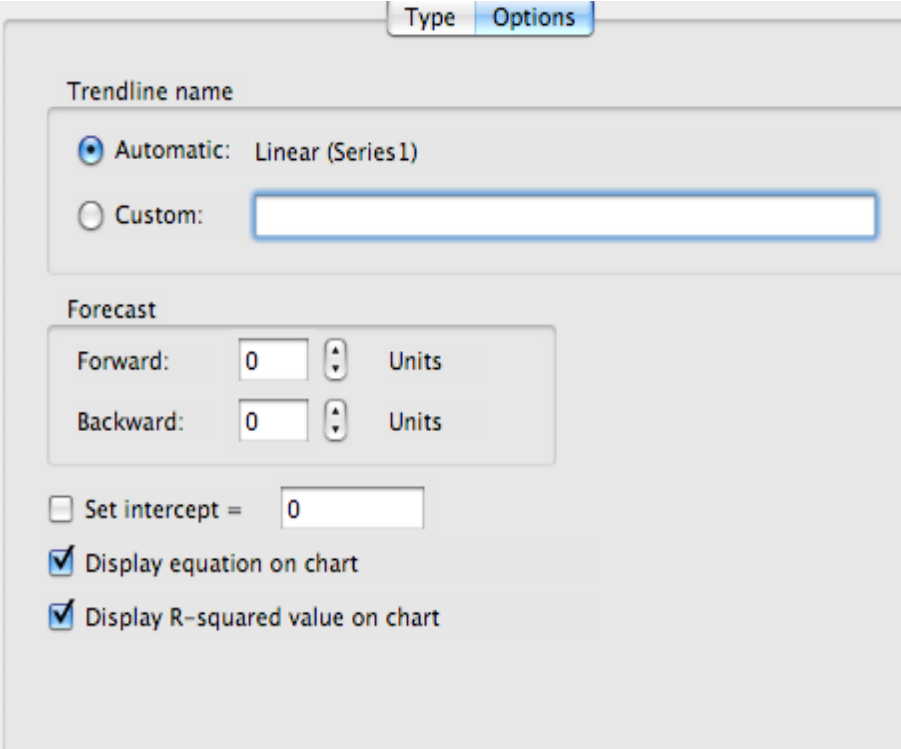
# Plotting a graph



- Highlight the data points, select 'Add Trendline'

# Plotting a graph

- Choose 'Linear' under 'Type'
- Select the options to display equation and  $R^2$  value on chart

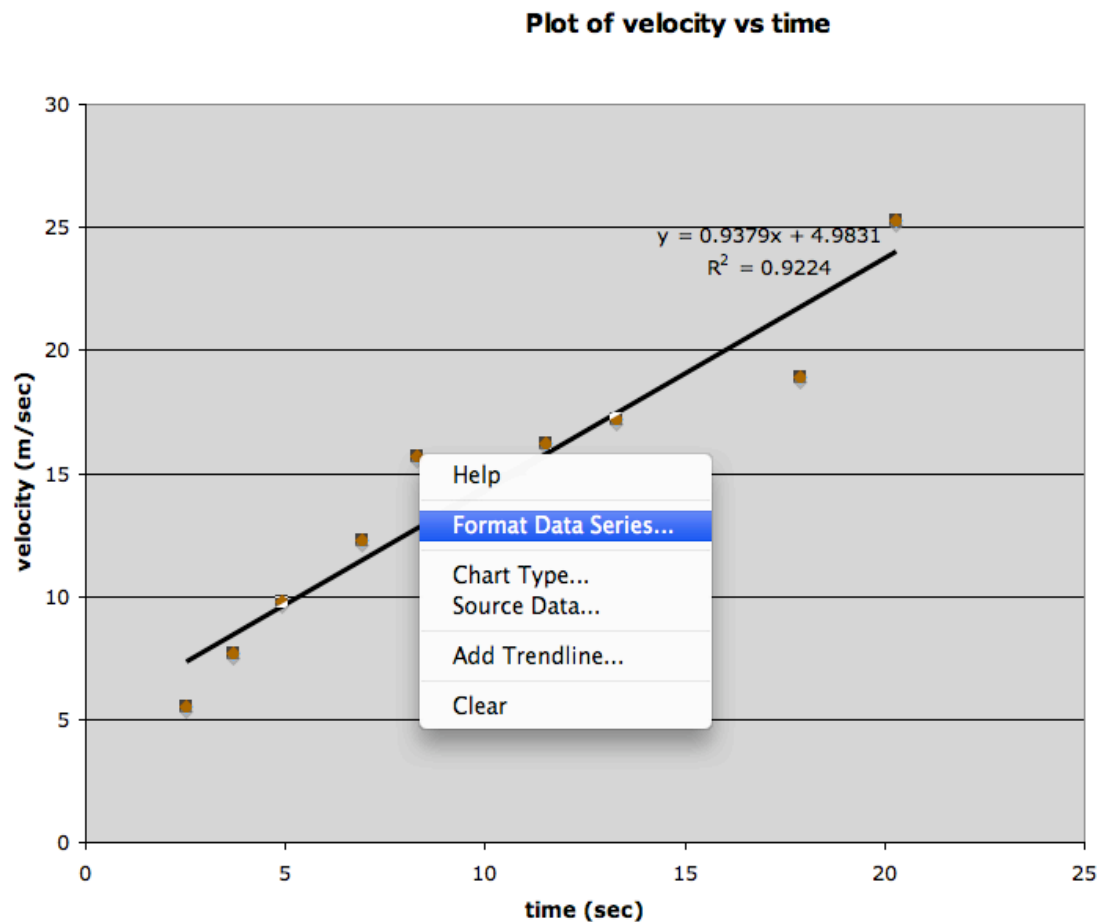


The image shows a software interface for configuring a trendline. It has two tabs: 'Type' and 'Options', with 'Options' currently selected. The 'Trendline name' section has two radio buttons: 'Automatic: Linear (Series1)' which is selected, and 'Custom:' followed by an empty text box. The 'Forecast' section contains two rows: 'Forward:' with a text box containing '0' and a 'Units' label, and 'Backward:' with a text box containing '0' and a 'Units' label. Below this, there are three checkboxes: 'Set intercept = 0' (unchecked), 'Display equation on chart' (checked), and 'Display R-squared value on chart' (checked).

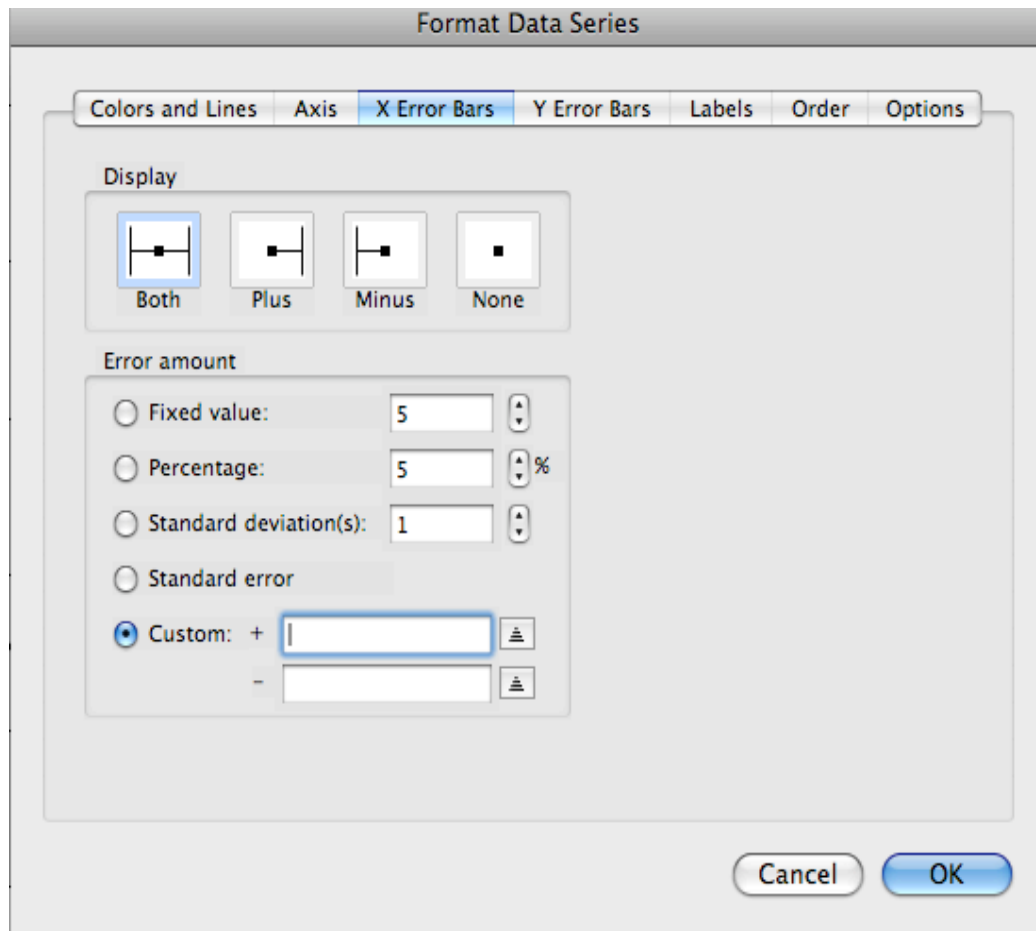
# Adding Error Bars

Now that we have the plot, lets add the error bars.

- Select the data points and right click
- Select 'Format Data Series'



# Adding Error Bars



- Click on the 'X Error Bar' tab
- Select 'Both'
- Under 'Custom', click on the widget on the right of the + box
- Go back to the data sheet and select the uncertainty in x-values (next slide)

# Adding Error Bars

**Table 1: Time and Velocity Data**

time (m)	uncertainty in time	velocity (m/sec)	uncertainty in velocity
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9R x 1C

**Using Linest function:**

Slope	0.937876188	4.983072931	Y-intercept
Slope Uncertainty	0.102847501	1.188614381	y-intercept uncertainty
R^2 Value	0.922358443	1.828360018	
	83.15790383	7	
	277.9885864	23.4003025	

Thus,

Acceleration (slope of velocity vs time curve) is:  $0.9 \pm 0.1 \text{ m/sec}^2$   
 Velocity at t=0 (y-intercept) is:  $5 \pm 1 \text{ m/sec}$

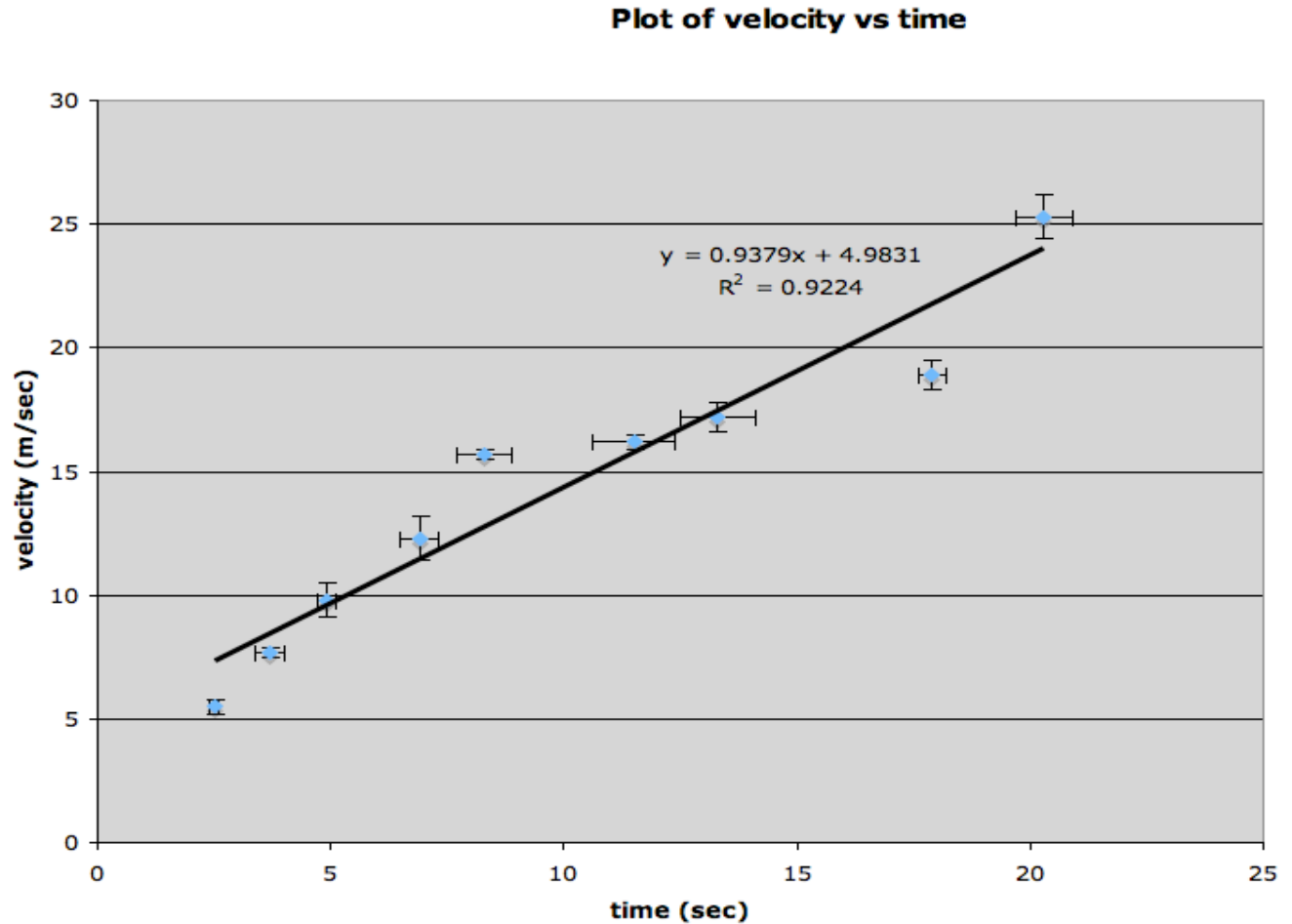
Format Data Series

=Sheet2!\$B\$4:\$B\$12

- Select the uncertainty as shown, then click on the widget on the right
- Repeat the same for the - box once done with the + box
- This adds the error bars in the X-direction

# Adding Error Bars

- Repeat the same procedure for putting error bars in the Y direction
- Once done, your graph should look as shown to the right



The End.