

## Using least-squares curve-fitting in Excel

1. Input [S] and Vo data
2. Make initial guesses for Vmax and Km values in separate cells
3. Create a 'fit' column for Vo data using the [S] data and the guesses at Km and Vmax
4. Create a 'residuals squared' column in which the difference between Vo and Vo-fit is squared. Make sure to use cell references and that the Km and Vmax cells are fixed using dollar signs.
5. Sum the residuals.
6. With the sum cell selected, start Solver from the Tools menu (you might need to install it from the 'Add-Ins' option).
7. Solve for the minimum value of your summed residuals by allowing Excel to change the cells for Km and Vmax (see screenshot below).
8. The second screenshot shows the result and a plot with both the Vo and Vo-fit data.

The screenshot displays an Excel spreadsheet and the Solver Parameters dialog box. The spreadsheet data is as follows:

[S] (mM)	Vo (mM/min)	Vo (fit)	Res^2
1	0.002	0.002125	1.5625E-08
2	0.004	0.0034	0.00000036
3	0.005	0.00425	5.625E-07
4	0.0058	0.00485714	8.8898E-07
5	0.0065	0.0053125	1.41016E-06
6	0.007	0.00566667	1.77778E-06
7	0.0073	0.00595	1.8225E-06
8	0.0075	0.00618182	1.7376E-06
9	0.0076	0.006375	1.50063E-06
10	0.0077	0.00653846	1.34917E-06
		sum =	1.14249E-05

The Solver Parameters dialog box is open, showing the following settings:

- Set Objective:
- To:  Max  Min  Value Of:
- By Changing Variable Cells:
- Subject to the Constraints: (Empty list)
- Make Unconstrained Variables Non-Negative
- Select a Solving Method:
- Solving Method: Select the GRG Nonlinear engine for Solver Problems that are smooth nonlinear. Select the LP Simplex engine for linear Solver Problems, and select the Evolutionary engine for Solver problems that are non-smooth.
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Km = 3.41981364 mM  
Vmax = 0.01067356 mM/min

[S] (mM)	Vo (mM/min)	Vo (fit)	Res^2
1	0.002	0.00241493	1.7217E-07
2	0.004	0.00393872	3.75545E-09
3	0.005	0.00498779	1.49099E-10
4	0.0058	0.00575408	2.10819E-09
5	0.0065	0.00633836	2.6128E-08
6	0.007	0.00679858	4.057E-08
7	0.0073	0.00717047	1.67791E-08
8	0.0075	0.00747722	5.18861E-10
9	0.0076	0.00773458	1.81116E-08
10	0.0077	0.00795358	6.43041E-08
sum =			3.44595E-07

