

Power Function Regression

Suppose we have a set of data that we want to fit to a power function of the form

$$f(x) = a x^p .$$

We start with:

$$y = a \cdot x^p$$

$$\ln(y) = \ln(a \cdot x^p) = \ln(a) + p \cdot \ln(x)$$

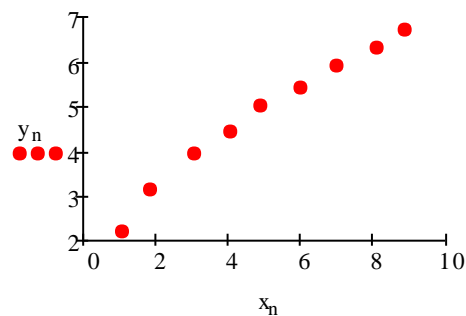
If we plot $\ln(y)$ versus $\ln(x)$ we have a linear function in which we can then use the same method as linear regression.

Example suppose we have the following Data:

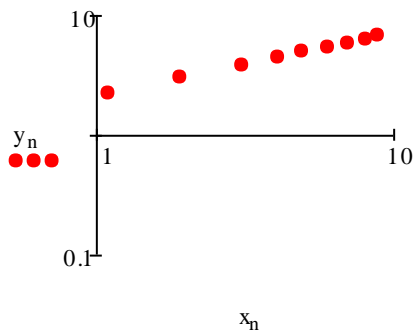
$$n := 0..8$$

$x_n :=$	$y_n :=$
1.1	2.2
1.9	3.1
3.1	3.9
4.1	4.4
4.9	5
6	5.4
7	5.9
8.1	6.3
8.9	6.7

If we plot the data we have



If we plot $\ln(y)$ vs $\ln(x)$ not we linearize (somewhat) the data. To do this in Mathcad go to FORMAT.
 under x-axis and y- axis and change to log scale



The method

1. Define the number of data points

$n := 0..8$ (Remember in Mathcad we start counting at 0 not 1)

Enter the x data by typing $x_n := 1.1$ (hit comma) 1.9 and so on. Enter the y data in the same way

$x_n :=$

1.1
1.9
3.1
4.1
4.9
6
7
8.1
8.9

$y_n :=$

2.2
3.1
3.9
4.4
5
5.4
5.9
6.3
6.7

$c := \text{intercept}(\ln(x), \ln(y))$

$c = 0.765$

$m := \text{slope}(\ln(x), \ln(y))$

$m = 0.519$

Now

$c = \ln(a)$

$a := e^c$

$a = 2.149$

$p := r$

$p = 0.519$

$f(x) := 2.149x^{.519}$

