Example 12

Polynomial fit example using EXCEL

The x y data set shown below is expected to follow a quadratic relationship. Obtain the fit by the least squares method. Discuss the relevant statistical parameters that characterize the fit. Make a suitable plot.

	x	y(Data)	y(Fit)	(y-mean y)^2	(y-y(Fit))^2
	0.2	2.55	2.57	119.39	0.000511
	0.35	2.86	2.98	112.80	0.016439
	0.55	3.84	3.69	92.79	0.024156
	0.73	4.18	4.47	86.40	0.086132
	1.05	6.46	6.23	49.18	0.054466
	1.32	8.29	8.07	26.87	0.050926
	1.65	10.26	10.75	10.32	0.240154
	1.86	13.11	12.72	0.13	0.15708
	2.01	14.77	14.24	1.68	0.28611
	2.55	19.83	20.55	40.41	0.515724
	2.92	26.07	25.63	158.68	0.197862
	3.11	27.58	28.47	198.92	0.796958
	3.5	35.37	34.82	479.33	0.306418
Mean	1.68	13.48	13.48	105.92	0.273294
	Index of correlation=			0.999	
	Standard error =			1.026	

Using EXCEL “Trend Line” polynomial (quadratic) option the fit is easily obtained as $y(\text{Fit}) = 2.232x^2 + 1.513x + 2.181$. The index of correlation is calculated using the relation given previously and is shown in the table. Index of correlation of 0.999 indicates that the fit is very good.

Plot shown below as Figure 19 indicates **graphically** the goodness of the fit. Note that the fit shown uses the "Trend Line" option with **"Polynomial Fit"** of EXCEL.

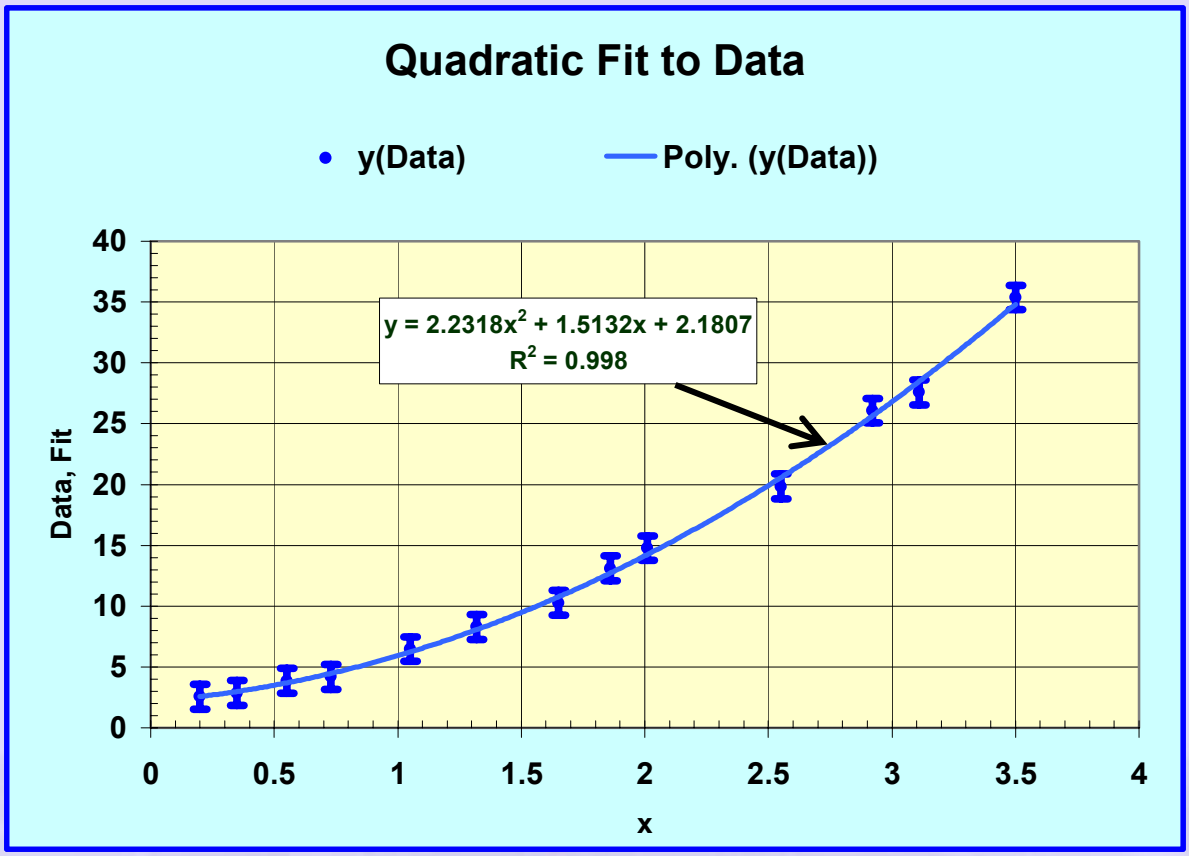

Figure 19 Polynomial fit examples showing the data and the fit.

The regression equation and its index of correlation are also given in the inset. Error bars are also indicated based on 95% confidence intervals.