Bhabha scattering DESY data

See www.hepdata.net/record/ins191231, Table 3, 14.0 GeV.

x	y
-0.7300	0.10115
-0.6495	0.12235
-0.5495	0.11258
-0.4494	0.09968
-0.3493	0.14749
-0.2491	0.14017
-0.1490	0.18190
-0.0488	0.22964
0.0514	0.25312
0.1516	0.30998
0.2520	0.40898
0.3524	0.62695
0.4529	0.91803
0.5537	1.51743
0.6548	2.56714
0.7323	4.30279

For columns x and y we have

$$x = \cos\theta, \quad y = \frac{d\sigma}{d\Omega}$$

The cross section formula is

$$\frac{d\sigma}{d\Omega} = \frac{\alpha^2}{4s} \left(\frac{\cos^2\theta + 3}{\cos\theta - 1} \right)^2 \times (\hbar c)^2$$

Let $\hat{y}$ be predicted values. The factor 10^{37} converts square meters to nanobarns.

$$\hat{y}_i = \left. \frac{d\sigma}{d\Omega} \right|_{\cos\theta = x_i} = \frac{\alpha^2}{4s} \left(\frac{x_i^2 + 3}{x_i - 1} \right)^2 \times (\hbar c)^2 \times 10^{37}$$

The following table shows predicted values for $s = (14.0\,\mathrm{GeV})^2$.

x	y	$\hat{y}$
-0.7300	0.10115	0.110296
-0.6495	0.12235	0.113816
-0.5495	0.11258	0.120101
-0.4494	0.09968	0.129075
-0.3493	0.14749	0.141592
-0.2491	0.14017	0.158934
-0.1490	0.18190	0.182976
-0.0488	0.22964	0.216737
0.0514	0.25312	0.264989
0.1516	0.30998	0.335782
0.2520	0.40898	0.443630
0.3524	0.62695	0.615528
0.4529	0.91803	0.907700
0.5537	1.51743	1.451750
0.6548	2.56714	2.609280
0.7323	4.30279	4.615090

The coefficient of determination R^2 measures how well predicted values fit the data.

$$R^2 = 1 - \frac{\sum (y - \hat{y})^2}{\sum (y - \bar{y})^2} = 0.995$$

The result indicates that $d\sigma$ explains 99.5% of the variance in the data.