$$\sum_{i=1}^{9} x_i = 4.5$$

$$\sum_{i=1}^{9} x_i^2 = 3.1875$$

$$\sum_{i=1}^{9} x_i^3 = 2.53125$$

$$\sum_{i=1}^{9} x_i^4 = 2.14160$$

$$\sum_{i=1}^{9} y_i = 3.32538$$

$$\sum_{i=1}^{9} x_i y_i = 2.07482$$

$$\sum_{i=1}^{9} x_i^2 y_i = 1.56072$$

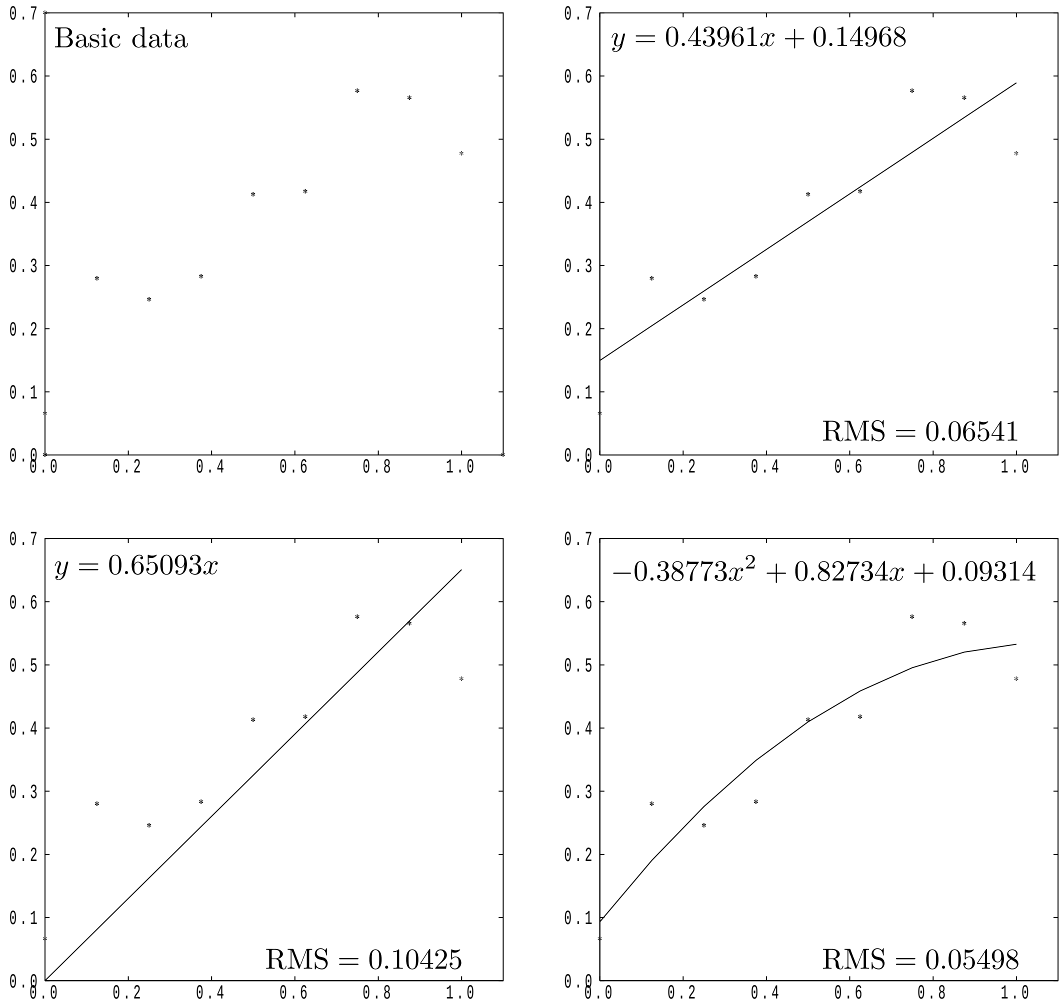

Figure 1: Least squares fits to the basic data $y = x - 0.4x^2$ with noise. Maximum noise level=0.25. Using 9 points.

In this case the equation obtained by the quadratic fit is not too far from the one used to generate the data. There is quite a substantial difference between the two linear fits. Note that the RMS level goes down when the number of coefficients increases.

$$\sum_{i=1}^{101} x_i = 50.5$$

$$\sum_{i=1}^{101} x_i^2 = 33.835$$

$$\sum_{i=1}^{101} x_i^3 = 25.5025$$

$$\sum_{i=1}^{101} x_i^4 = 20.50333$$

$$\sum_{i=1}^{101} y_i = 37.03741$$

$$\sum_{i=1}^{101} x_i y_i = 23.5922$$

$$\sum_{i=1}^{101} x_i^2 y_i = 17.2662$$

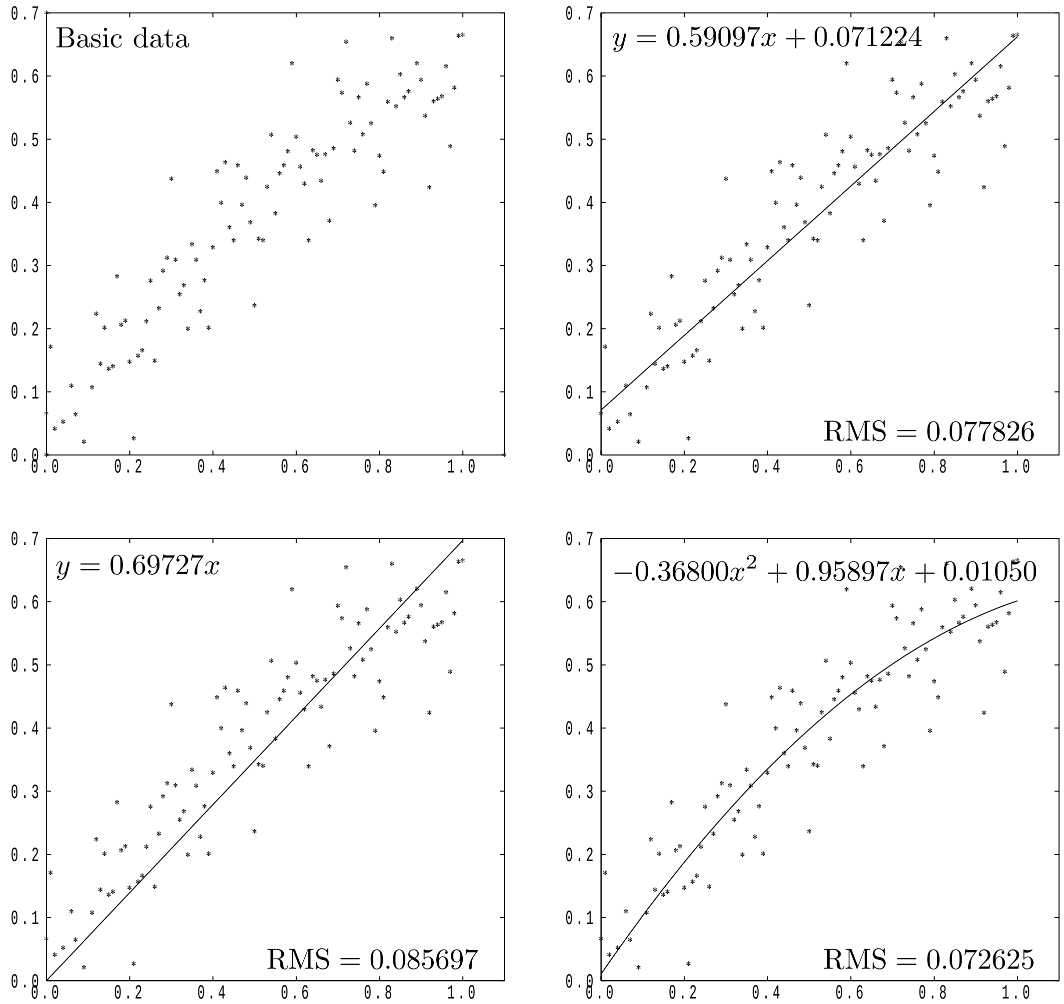

Figure 2: Least squares fits to the basic data $y = x - 0.4x^2$ with noise. Maximum noise level=0.25. Using 101 points.

In terms of the RMS errors, there is little to choose between the solutions. Indeed, all three fits look very reasonable. But this could well be courtesy of the fact that the noise level is quite high.

$$\sum_{i=1}^{101} x_i = 50.5$$

$$\sum_{i=1}^{101} x_i^2 = 33.835$$

$$\sum_{i=1}^{101} x_i^3 = 25.5025$$

$$\sum_{i=1}^{101} x_i^4 = 20.50333$$

$$\sum_{i=1}^{101} y_i = 36.9803$$

$$\sum_{i=1}^{101} x_i y_i = 23.6256$$

$$\sum_{i=1}^{101} x_i^2 y_i = 17.2942$$

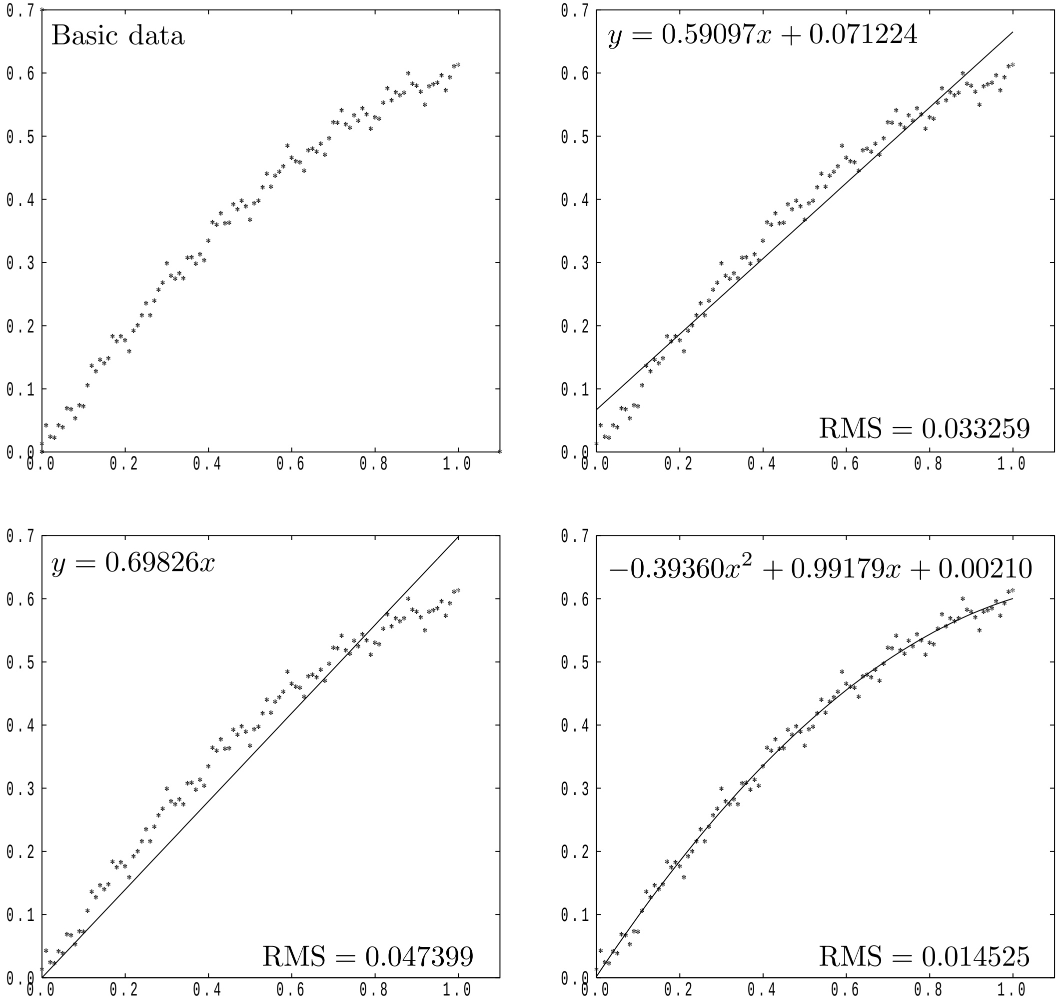

Figure 3: Least squares fits to the basic data $y = x - 0.4x^2$ with noise. Maximum noise level=0.05. Using 101 points.

With a lower noise level there is a strong reduction in the RMS when the quadratic term is included in the Least Squares fit. The model quadratic is recovered to within a fairly small error.