Suppose we are given column vectors

$$X_1, \dots, X_n \qquad X_j = \begin{pmatrix} x_{1j} \\ \vdots \\ x_{mj} \end{pmatrix} \text{ of } m \text{ observations}$$

in which the i th observation yields x_{ij} for variable x_j and similarly for Y. Let $\begin{pmatrix} 1 \\ \vdots \\ 1 \end{pmatrix} = U$. Find constants $a_1, \dots, a_n, b$ so that

$$\left| Y - \sum a_j X_j + bU \right|^2 \text{ is minimized.}$$

If $\{X_1, \dots, X_n, U\}$ is linearly independant the methods of this section and the previous one can be used to find the coefficients $a_1, \dots, a_n, b$. However, in most cases it is much better to use more systematic methods that would require too much time to describe (but are not much more complicated!).