![MedCalc logo - easy-to-use statistical software]

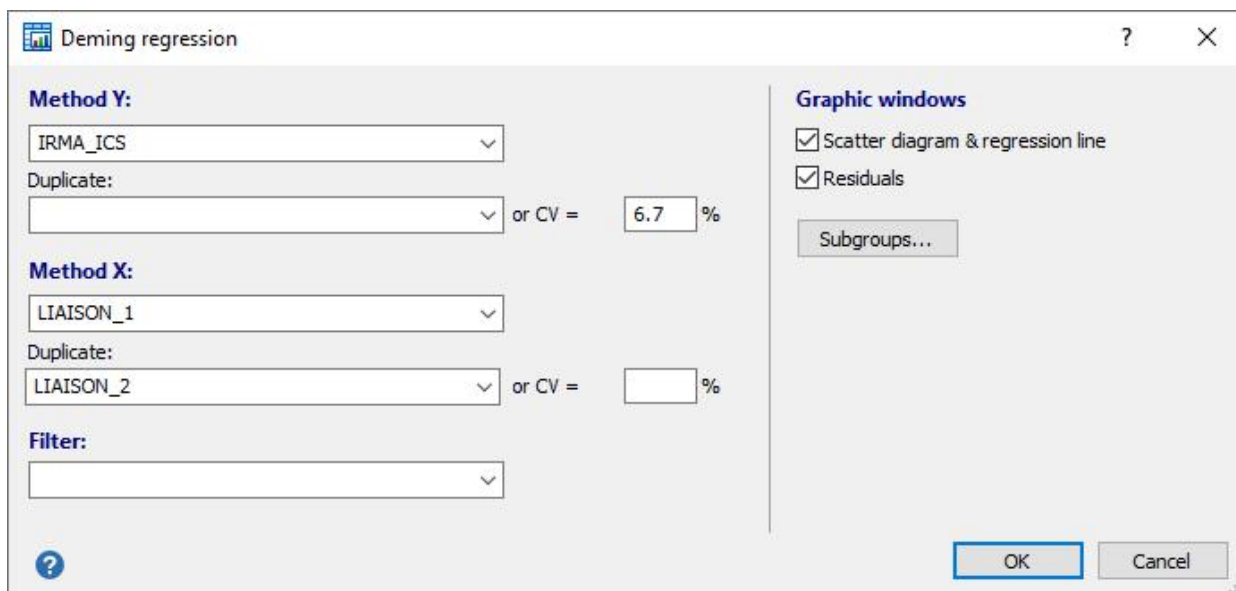## ☰   Deming regression

Command: Statistics
 ┊······· Method comparison & evaluation
  ┊······· Deming regression

Description

Allows to perform method comparison using the Deming regression model (Cornbleet & Gochman, 1979).

Whereas the ordinary linear regression method assumes that only the Y measurements are associated with random measurement errors, the Deming method takes measurement errors for both methods into account.

Required input

Select the variables for the two techniques you want to compare.

For each of both techniques you can either enter 2 variables (which contain repeated measurements) or you can enter only one variable, in which case you will have to enter an already established Coefficient of Variation (CV, expressed as a percentage).

As an option, you can create 2 graphs:

- A scatter diagram with the regression line
- The residuals plot.

Use the Subgroups button if you want to identify subgroups in the scatter diagram and residuals plot. A new dialog box is displayed in which you can select a categorical variable. The graph will display different markers for the different categories in this variable.

Results

The results are displayed in the following text window:
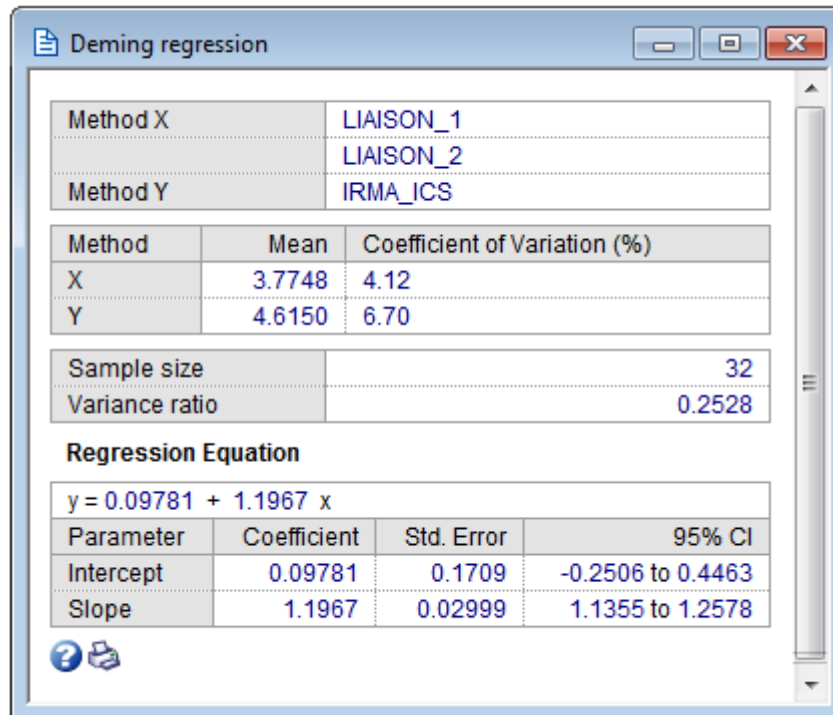
- Mean and Coefficient of Variation (%) for both methods
- Sample size: the number of (selected) data pairs
- Variance ratio: this is the ratio of the measurement errors of X and Y.
- The regression equation, Intercept and Slope with 95% confidence interval
- The Intercept and Slope are calculated according to Combleet & Gochman, 1979. The standard errors and confidence intervals are estimated using the jackknife method (Armitage et al., 2002).
  The 95% confidence interval for the Intercept can be used to test the hypothesis that A=0. This hypothesis is accepted if the confidence interval for A contains the value 0. If the hypothesis is rejected, then it is concluded that A is significantly different from 0 and both methods differ at least by a constant amount.
  The 95% confidence interval for the Slope can be used to test the hypothesis that B=1. This hypothesis is accepted if the confidence interval for B contains the value 1. If the hypothesis is rejected, then it is concluded that B is significantly different from 1 and there is at least a proportional difference between the two methods.

Scatter diagram and regression line

This graph shows the observations with the regression line (solid line) and identity line (x=y, dotted line).
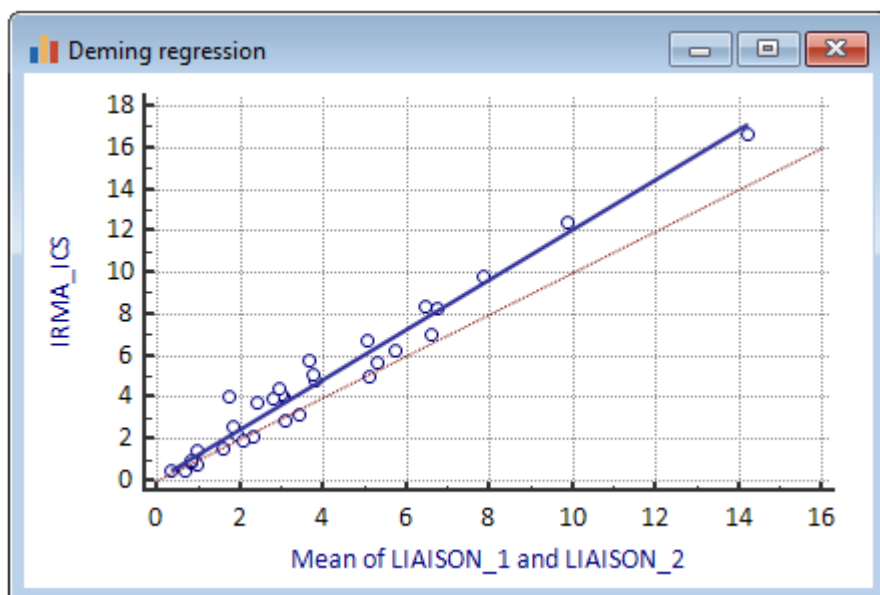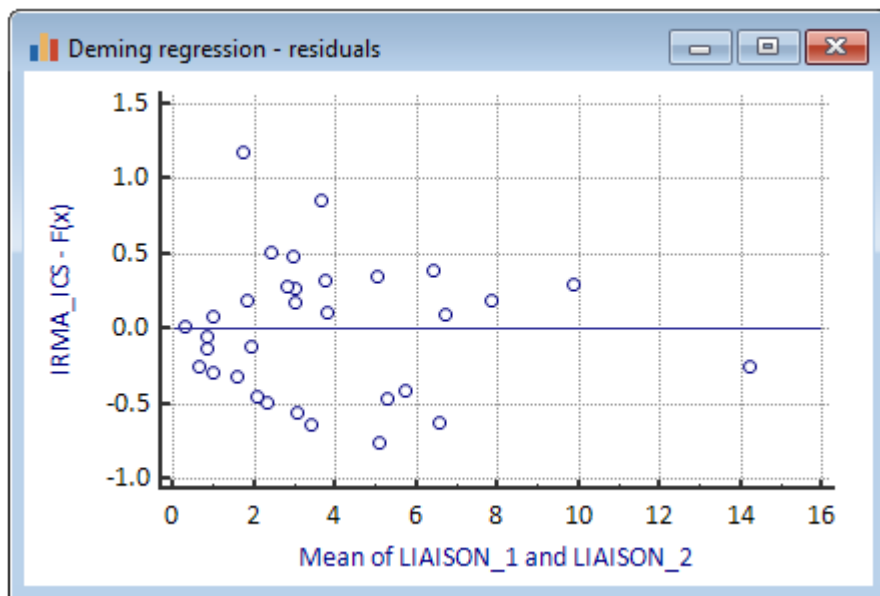
Extrapolation

MedCalc only shows the regression line in the range of observed values. As a rule, it is not recommended to extrapolate the regression line beyond the observed range. To allow extrapolation anyway, right-click in the graph and click **Allow extrapolation** on the context menu.
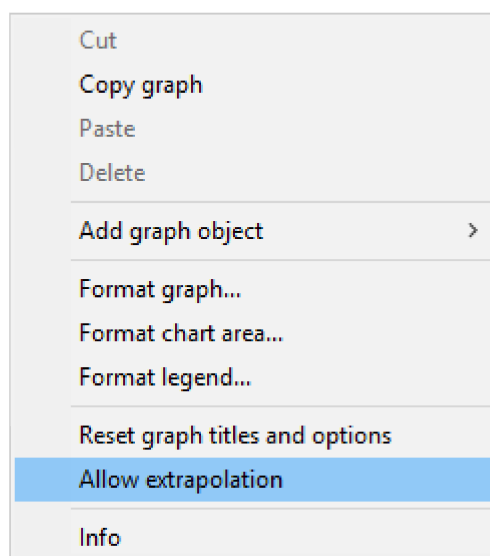
Residuals plot

The residual plot allows for the visual evaluation of the goodness of fit of the linear model. Residuals may point to possible outliers (unusual values) in the data or problems with the linear regression model. If the residuals display a certain pattern, you can expect the two variables not to have a linear relationship.

Outliers, defined here as residuals outside the 4 SD limit, are plotted in a different color. Linnet & Boyd (2012) recommend that these measurements should not just be rejected automatically, but the reason for their presence should be scrutinized.

Literature

- Armitage P, Berry G, Matthews JNS (2002) Statistical methods in medical research. 4th ed. Blackwell Science. **amazon**

- Cornbleet PJ, Gochman N (1979) Incorrect least-squares regression coefficients in method-comparison analysis. Clinical Chemistry 25:432-438. **PubMed**

- Linnet K, Boyd JC (2012) Selection and analytical evaluation of methods - with statistical techniques. In Burtis CA, Ashwood ER, Bruns DE (eds). Tietz Textbook of Clinical Chemistry and Molecular Diagnostics (5th edn). Elsevier Saunders, St Louis, MO, pp. 201-228. **amazon**

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