Probability calculator

Menu:	QCExpert	Probability calculator

This module is helpful for a quick calculation of quantiles and distribution function values for four distributions, which are often used for construction of critical values of statistical tests. Namely, they are: normal, Student-t, chi-square, Fisher-F. Various requests are entered in a dialogue panel. If needed, distribution function plot can be generated.

Data and parameters

Probability calculator has no mandatory data entry. Hence, it can be invoked even with an empty data spreadsheet. Upon invoking the dialog panel, the distribution, we want to work with, is specified. Next, its parameters have to be specified. For the normal distribution, mean and standard deviation are entered. For the Student-t, chi-squared or Fisher-F distribution, degrees of freedom ν are entered. While the t and chi-squared distributions have only one degree of freedom, ν_1 (denoted as N1) the F-distribution has two: ν_1 and ν_2 (denoted as N1 and N2). After entering a value to the *Quantile* field, and pressing the *Probability* button, requested probability (distribution function value) appears in the *Probability* field. On the other hand, when a value is entered in the *Probability* filed, pressing the *Quantile* button invokes calculation of the requested quantile, which appears in the *Quantile* field. When the Plot button is pressed, distribution function (for a selected distribution type, with previously entered parameters) is plotted. When working with a normal distribution, data points from the *Data* spreadsheet can be used to compute mean and standard deviation. The column containing data can be selected in the Data field of the Dialog panel. The Probability calculator can be used not only for a quick computation of probabilities or quantiles, but also for computing ARL. ARL is a function of a given probability P. When P<0.5, ARL is the reciprocal value of P, ARL=1/P, otherwise ARL=1/(1-P). ARL is the acronym for Average Run Length, that is the average number of data points counted between two consecutive occasions, when the p-th quantile is exceeded.

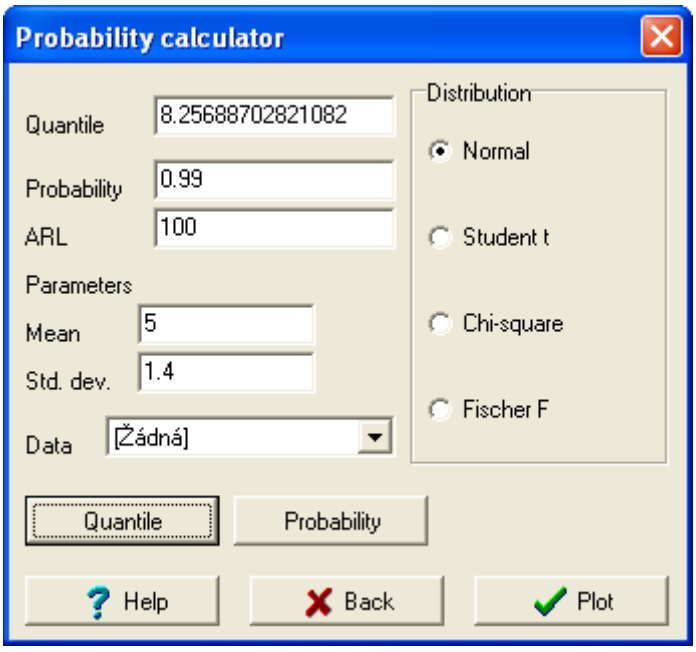


Fig. 1 Dialog panel for Probability calculator (normal distribution example)

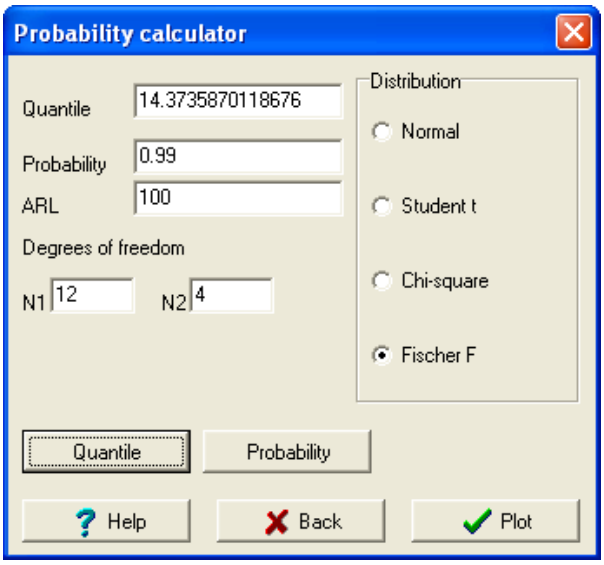


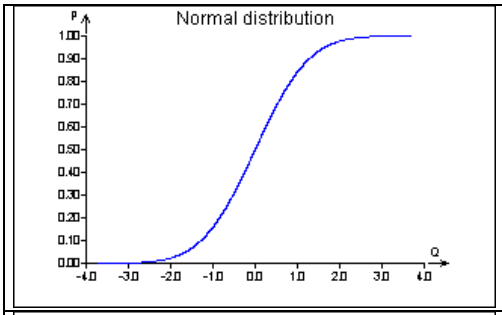
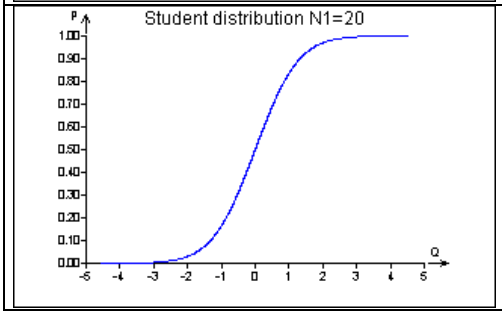
Fig. 2 Dialog panel for Probability calculator (Fisher-F distribution example)

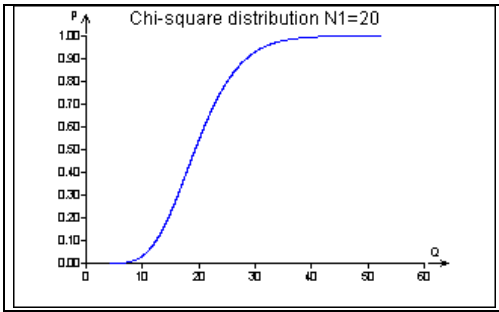
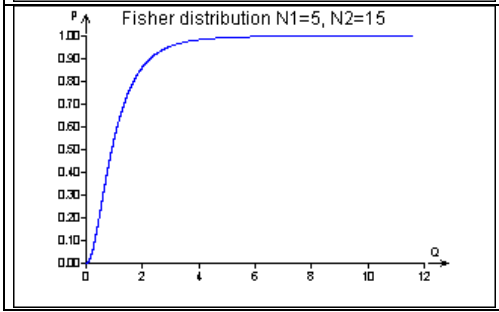
Protocol

This module produces no Protocol.

Graphs

Distribution function plot is produced upon pressing the Plot button (after a distribution type was selected and its parameters were entered previously). Approximate distribution function values can be red from the plot when it is zoomed and plotted with the rectangular mesh. Quantile is always plotted on the horizontal axis, while the distribution function value (probability, that the random variable of interest will be smaller than or equal to the number equal to the horizontal coordinate) is plotted on the vertical axis.

	Standard normal (i.e. $N(0,1)$)distribution function plot.
	Student-t distribution with n_1=6, distribution function.

	chi-square distribution with n_1=10, distribution function.
	Fisher-F distribution with n_1=10 and n_2=12, distribution function.