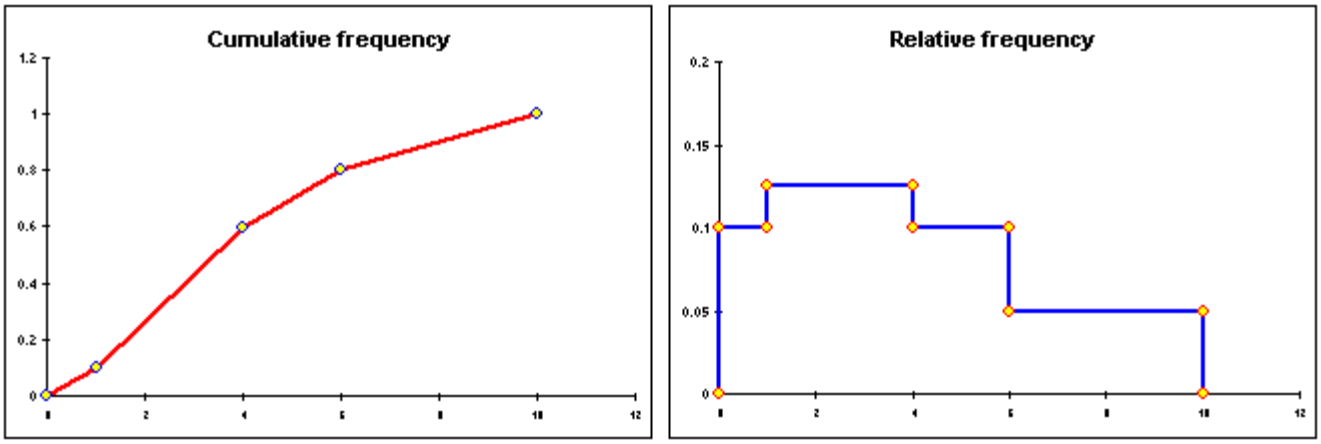
Cumulative Ascending

The Cumulative Ascending Distribution can be constructed with Crystal Ball's Custom distribution

Cumulative ascending equations

The Cumulative distribution in Crystal Ball can be constructed using Crystal Ball's Custom distribution, and requires two arrays of data, *{xi} and {Pi}*) where *{ i}* is an array of *x*-values with cumulative probabilities *{Pi}* and where the distribution falls between the minimum and maximum. The figure below shows the Cumulative distribution using data ({0,1,4,6,10},{0,0.1,0.6,0.8,1.0}) as it is defined in its cumulative form and how it looks as a relative frequency plot.



Uses

1. Empirical distribution of data

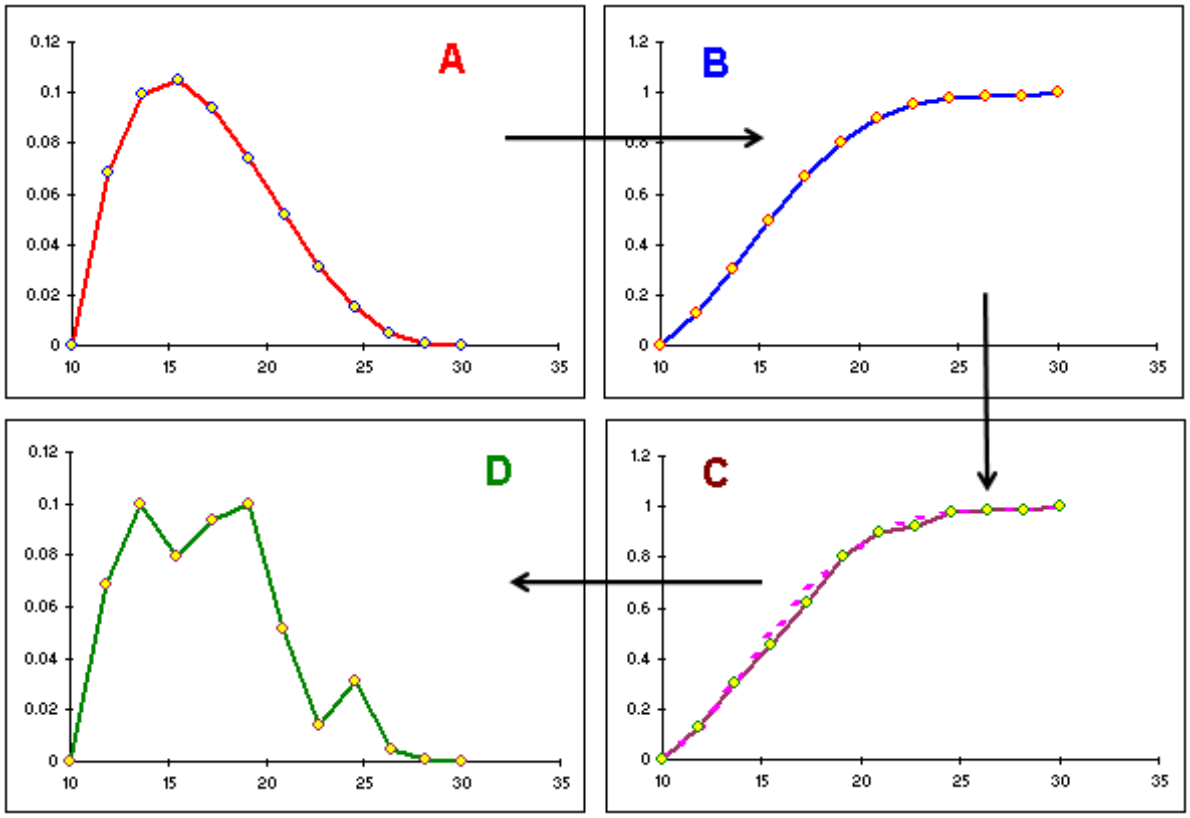
The Cumulative distribution is very useful for converting a set of data values into a first or second order empirical distribution that can be sampled by Crystal Ball.

2. Modeling expert opinion

The Cumulative distribution can be used to construct uncertainty distributions when using some classical statistical methods. Examples: p in a Binomial process; l in a Poisson process.

3. Modeling expert opinion

The Cumulative distribution is used in some texts to model expert opinion. The expert is asked for a minimum, maximum and a few percentiles (e.g. 25%, 50%, 75%). However, we have found it largely unsatisfactory because of the insensitivity of its probability scale. A small change in the shape of the Cumulative distribution that would pass unnoticed produces a radical change in the corresponding relative frequency plot that would not be acceptable. The figure below provides an illustration:



A smooth and natural relative frequency plot (A) is converted to a cumulative frequency plot (B) and then altered slightly (C). Converting back to a relative frequency plot (D) shows that the modified distribution is dramatically different from the original, though this would almost certainly not have been appreciated by comparing the cumulative frequency plots. For this reason, we usually prefer to model expert opinion looking at the relative frequency distribution instead.

The cumulative distribution *is* however very useful to model an expert's opinion of a variable whose range covers several orders of magnitude in some sort of exponential way. For example, the number of bacteria in a kg of meat will increase exponentially with time. The meat may contain 100 units of bacteria or 1 million. In such circumstances, it is fruitless to attempt to use a General distribution directly.