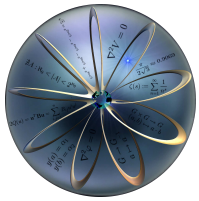

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hazard function

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Defines	cumulative hazard function

Let Y be a random variable with probability density function $f_Y(y)$. Then the *hazard function* $h(y)$ is defined to be:

$$h(y) = \frac{f_Y(y)}{1 - F_Y(y)} = \frac{f_Y(y)}{S(y)},$$

where $S(y)$ is the survivor function and Y is the survival time.

The hazard function is the rate of probability of death (non survival) is changing at time $Y = y$, given survival up to time y:

$$h(y) = \lim_{\Delta y \to 0} \frac{P(y \leq Y \leq y + \Delta y \mid Y > y)}{\Delta y}.$$

The *cumulative hazard function*, $H(y)$ of Y is defined as

$$H(y) = \int_{-\infty}^{y} h(t)dt.$$

From this definition, we see that $H(y) = -\ln S(y)$.

Examples. The hazard functions for the three most widely used probability density functions for survival time are:

- The exponential distribution, with $h(y) = \gamma$.
- The Weibull distribution, with $h(y) = \gamma y^{\gamma-1}$ using the standard Weibull distribution.
- The extreme-value distribution, with $h(y) = \frac{1}{\beta} \exp(\frac{y-\alpha}{\beta})$.