List of statistical formulas with description

Data sampling & sorting

$f_i = \frac{n_i}{n} \cdot 100 [\%]$	relative frequency
$N_1 = n_1; N_2 = N_1 + n_2; N_3 = N_2 + n_3; ...$	cumulative (absolute) frequency
$F_1 = f_1; F_2 = F_1 + f_2; F_3 = F_2 + f_3; ...$	cumulative relative frequency
$h = \frac{(\max - \min)}{m}$	width of interval (class); grouped frequency distribution
$m = \sqrt{n}$	number of intervals (classes); grouped frequency distribution

Descriptive statistics

$\mu = \frac{\sum x_i}{N}$ (simple) or $\mu = \frac{\sum x_i \cdot n_i}{N}$ (weighted)	population mean
$\bar{x} = \frac{\sum x_i}{n}$ (simple) or $\bar{x} = \frac{\sum x_i \cdot n_i}{n}$ (weighted)	sample mean
IQR = Q3 – Q1	interquartile range
R = max – min	range
$\sigma^2 = \frac{\sum (x_i - \mu)^2}{N}$ (simple) or $\sigma^2 = \frac{\sum (x_i - \mu)^2 \cdot n_i}{N}$ (weighted)	population variance
$s^2 = \frac{\sum (x_i - \bar{x})^2}{n-1}$ (simple) or $s^2 = \frac{\sum (x_i - \bar{x})^2 \cdot n_i}{n-1}$ (weighted)	sample variance
$\sigma = \sqrt{\sigma^2}$	population standard deviation

$s = \sqrt{s^2}$ sample standard deviation

$CV_s = \frac{s}{\bar{x}} \cdot 100 [\%]$ coefficient of variation

$\gamma_1 = \frac{\sum (x_i - \bar{x})^3}{s^3 \cdot n}$ (simple) or coefficient of skewness

$\gamma_1 = \frac{\sum (x_i - \bar{x})^3 \cdot n_i}{s^3 \cdot n}$ (weighted)

$\gamma_2 = \frac{\sum (x_i - \bar{x})^4}{s^4 \cdot n} - 3$ (simple) or coefficient of kurtosis

$\gamma_2 = \frac{\sum (x_i - \bar{x})^4 \cdot n_i}{s^4 \cdot n} - 3$ (weighted)

Theory of probability

no formulas

Point and interval estimate

$est\, \mu = \bar{x}$ point estimate of mean

$est\ \sigma^2 = s_1^2$ point estimate of variance

$est\ \sigma = s_1$ point estimate of standard deviation

$P(\bar{x} - \Delta < \mu < \bar{x} + \Delta) = 1 - \alpha$ interval estimate of mean

$\Delta = u_{(1-\alpha/2)} \cdot \frac{s_1}{\sqrt{n}}$ sampling error if n > 30

$\Delta = t_{(\alpha;n-1)} \cdot \frac{s_1}{\sqrt{n}}$ sampling error if n <= 30

$P\left(\frac{(n-1) \cdot s_1^2}{\chi^2_{(\alpha/2;n-1)}} < \sigma^2 < \frac{(n-1) \cdot s_1^2}{\chi^2_{(1-\alpha/2;n-1)}} \right) = 1 - \alpha$ interval estimate of variance

$P\left(\sqrt{\frac{(n-1) \cdot s_1^2}{\chi^2_{(\alpha/2;n-1)}}} < \sigma^2 < \sqrt{\frac{(n-1) \cdot s_1^2}{\chi^2_{(1-\alpha/2;n-1)}}} \right) = 1 - \alpha$ interval estimate of standard deviation

$$n = u^2_{(1-\alpha/2)} \cdot \frac{s_1^2}{\Delta^2}$$

sample size

Hypothesis testing (tests for mean)

$$u = \frac{\bar{x} - \mu_0}{\frac{s_1}{\sqrt{n}}}$$

hypothesis test about a population mean if n > 30

$$t = \frac{\bar{x} - \mu_0}{\frac{s_1}{\sqrt{n}}}$$

hypothesis test about a population mean if n <= 30

$$u = \frac{\bar{x}_1 - \bar{x}_2 - (\mu_1 - \mu_2)}{\sqrt{\frac{n_2 s_{11}^2 + n_1 s_{12}^2}{n_1.n_2}}} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{n_2 s_{11}^2 + n_1 s_{12}^2}{n_1.n_2}}}$$

hypothesis test about the difference between means of two populations (independent samples) if n > 30

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(n_1 - 1)s_{11}^2 + (n_2 - 1)s_{12}^2}{n_1 + n_2 - 2}}} . \sqrt{\frac{n_1.n_2}{n_1 + n_2}}$$

hypothesis test about the difference between means of two populations (independent samples) if n <= 30

$$t = \frac{\bar{d}}{\sqrt{\frac{\sum_{i=1}^{n} \left(d_i - \bar{d}\right)^2}{n \cdot (n-1)}}}$$

hypothesis test about the difference between means of two populations (matched samples)