uniform distr: $f(x;k)=1/k$ $\mu=\dfrac{\sum_{i=1}^{k} x_i}{k}$ $\sigma^2=\dfrac{\sum_{i=1}^{k}(x_i-\mu)^2}{k}$

***binomial*:** $b(x;n,p)=\binom{n}{x}p^x\,q^{n-x}$ $B(x;n,p)=\sum_{i=0}^{x} b(x;n,p)$

$\mu=n\,p$ $\sigma^2=n\,p\,q$

multinomial

$$f(x_1,x_2,...,x_k;p_1,p_2,...,p_k)=\binom{n}{x_1,x_2,...x_k}p_1^{x_1}p_2^{x_2}...p_k^{x_k}$$

hypergeometric $h(x;N,n,k)=\dfrac{\binom{k}{x}\binom{N-k}{n-x}}{\binom{N}{n}}$, $x=0,1,2,...n$

$\mu=\dfrac{nk}{N}$ $\sigma^2=\left(\dfrac{N-n}{N-1}\right)\left(\dfrac{nk}{N}\right)\left(1-\dfrac{k}{N}\right)$

hypergeometric multinominal: $f(x_1,x_2,...,x_k;a_1,a_2,...,a_k,N,n)=\dfrac{\binom{a_1}{x_1}\binom{a_2}{x_2}....\binom{a_k}{x_k}}{\binom{N}{n}}$

negative binomial (first k successes): $b^*(x;k,p)=\binom{x-1}{k-1}p^k\,q^{x-k}$, $x=k,k+1,k+2,...$

geometric (first success) $g(x,p)=pq^{x-1}$, $x=1,2,3,....$ $\mu=\dfrac{1}{p}$ $\sigma^2=\dfrac{1-p}{p^2}$

Poisson $p(x;\lambda t) = \frac{e^{-\lambda t}(\lambda t)^x}{x!}, \quad x = 0,1,2,...,$ $\quad P(r;\lambda t) = \sum_{x=0}^{r} p(x;\lambda t)$ $\quad$ *see Table A.2*

uniform distr:

$$f(x;A,B) = \frac{1}{B-A}, \quad \text{where } A \le x \le B$$
$$= 0 \quad \text{elsewhere}$$

$$\mu = \frac{A+B}{2} \qquad \sigma^2 = \frac{(B-A)^2}{12}$$

Normal

$$Z = \frac{X-\mu}{\sigma} \qquad P(x_1 < X < x_2) = \frac{1}{\sigma\sqrt{2\pi}} \int_{x_1}^{x_2} e^{-0.5\left\{\frac{(x-\mu)}{\sigma}\right\}^2} dx = \frac{1}{\sigma\sqrt{2\pi}} \int_{z_1}^{z_2} e^{-0.5\{z^2\}} dz = \int_{z_1}^{z_2} n(z;0,1)\, dz$$

Normal approx of binomial $\mu = np \qquad \sigma^2 = npq \qquad Z = \frac{X-np}{\sqrt{npq}}$

Note: remember ½ offset

gamma

$$\Gamma(x) = \int_0^\infty x^{\alpha-1} e^{-x} dx, \qquad \alpha > 0 \qquad f(x = time) = \begin{cases} \frac{x^{\alpha-1} e^{-x/\beta}}{\beta^\alpha \Gamma(\alpha)} & x > 0 \\ 0 & elsewhere \end{cases} \qquad f(t) = \frac{e^{-t/\beta}}{\beta}$$

$\mu = \alpha\beta \qquad \sigma^2 = \alpha\beta^2$

Exponential $f(x) = \begin{cases} \frac{e^{-x/\beta}}{\beta} & x > 0 \\ 0 & elsewhere \end{cases} \qquad \mu = \alpha\beta \qquad \sigma^2 = \alpha\beta^2$

log-normal: $f(x) = \frac{e^{-0.5\left\{\frac{(\ln[x]-\mu)^2}{\sigma^2}\right\}}}{\sigma\sqrt{2\pi}}, \quad x \geq 0$

$$E(X) = e^{\mu+\sigma^2/2}$$

$$Var(X) = e^{2\mu+\sigma^2}\left(e^{\sigma^2} - 1\right)$$

Z-values $s^2 = \frac{\sum_{i=1}^{n}\left(X_i - \overline{X}\right)^2}{n-1}$ $\quad s^2 = \frac{n\sum_{i=1}^{n}(X_i)^2 - \left(\sum_{i=1}^{n} X_i\right)^2}{n(n-1)}$ $\quad Z = \frac{\overline{X}-\mu}{\sigma/\sqrt{n}}$

---

quantile plots: $f_i = \frac{i-(3/8)}{n+(1/4)}$

$q_{\mu,\sigma}(fi) = \mu + \sigma\{4.91\,[\,fi^{\,0.14} - (1 - fi\,)^{0.14}\,]\,\}$

Example, for std normal:

$q_{0,1}(fi\,) = 0 + 1\{4.91\,[fi^{\,0.14} - (1 - fi\,)^{0.14}\,]\,\}$

---

difference in means, normal

$\mu_{\overline{X}_1-\overline{X}_2} = \mu_1 - \mu_2$ $\quad \sigma^2_{\overline{X}_1-\overline{X}_2} = \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}$ $\quad Z = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$

Chi-squared $\chi^2 = \frac{(n-1)S^2}{\sigma^2} = \sum_{i=1}^{n}\frac{\left(X_i - \overline{X}\right)^2}{\sigma^2}, \quad \upsilon = n-1$

Student t $T = \frac{\overline{X}-\mu}{S/\sqrt{n}}$

F-test: $F = \frac{S_1^2/\sigma_1^2}{S_2^2/\sigma_2^2}$ Note: remember that typically assume $\sigma_1 = \sigma_2$ $\quad F = \frac{S_1^2}{S_2^2}$

$$f_{1-\alpha,\upsilon_1,\upsilon_2} = \frac{1}{f_{\alpha,\upsilon_2,\upsilon_1}}$$

No other references or materials allowed