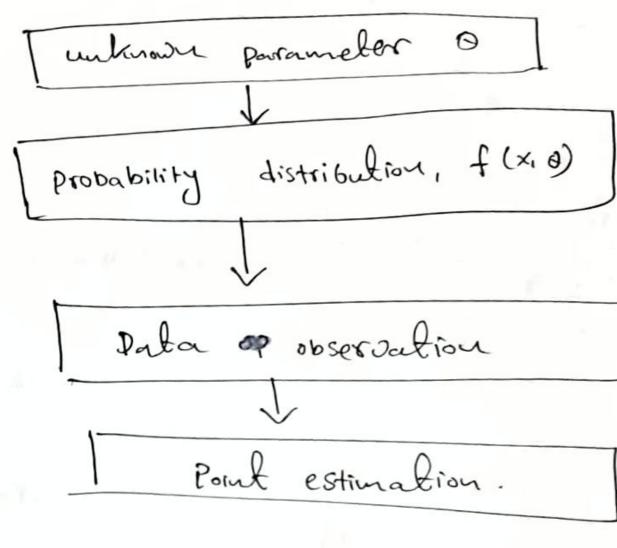
Statistical Estimation and sampling Distribution

Parameter. In statistical, the term parameter is used to denote a quantity o, that is a property of an unknown probability distribution. For example it may be the mean, variance or a particular quantile of the probability distribution.

Statistics: En satistical, the term statistic is use to denote a quantity that is a property of a sample. for example, it may be sample varience or a particular sample quantile.

point of Estimate of Parameter



$$E(s^2) = \frac{1}{n-1}E\left(\sum_{i=1}^{n} (x_i - \bar{x})^2\right)$$

$$=\frac{1}{n-1}E\left(\sum_{i=1}^{n}((x_{i}-\mu)-(\bar{x}-\mu))\right)$$

=
$$\frac{1}{1-4} \left(\sum_{i=1}^{n} E((X-M)^2) - nE((X-M)^2) \right)$$

Now notice that

Furtuer morp

50 that = ((a-H)L) =

E(st)= = [5 62n (6))=61

Example 1

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200B(4, 20)

so that

$$E(h) = E(x) = \mu E(\frac{\pi}{2}x) = \frac{\pi}{2}E(x) = \frac{\pi}{2}E(x)$$

(100)

7.2 Properties of point Estimate.

x~B(n,p)

$$4 E \left(\vec{p} \right) = E \left(\frac{x}{n} \right) = \frac{1}{n} E(x) = \frac{1}{n} n P = P$$

Hence is the unbiased point astimated the success probability p

Information

$$\frac{1}{100} = \frac{x_1}{6} + \frac{x_2}{3} + 9$$

Solution

E (H) = H1

E(XI)= M and E

(4)

$$E\left(\hat{x}_{1}\right) = E\left(\frac{x_{1}}{x_{1}} + \frac{x_{2}}{x_{2}}\right)$$

$$E\left(H_{1}^{\prime}\right) = \frac{f_{\chi_{1}}}{\chi} \frac{E_{\chi_{2}}}{\chi}$$

$$= \frac{H}{\chi} + \frac{H}{\chi}$$

$$= H\left(A_{1}S\right)$$

$$E(\mu_2^{\prime}) = E(\frac{\chi_1}{4} + \frac{3\chi_2}{4})$$

$$= \frac{E_{x1}}{4} + \frac{E_{3x^2}}{4}$$

$$= \frac{1}{4} + \frac{3p}{4}$$

$$\mu_{3}^{\lambda} = \frac{z_{1}}{6} + \frac{z_{2}}{3} + 9$$

$$E\left(\frac{1}{100}\right) = E\left(\frac{21}{6} + \frac{22}{3} + 9\right)$$

$$E(M_3) = \frac{E_{21}}{6} + \frac{E_{x2}}{3} + 9$$

$$=\frac{M}{2}+9$$

MB is the smallest (Ans)

MSE
$$(M^2) = Var(M^2) + bias^2$$

= $135 + 0$
= $\frac{145}{4}$

8 cm

$$MSE$$
 (MS) = $Var(MS) + bias^2$
= $\frac{70}{36} + (9 - \frac{91}{2})^2$

7.3 Sampling Distribution

Sample proportion

2~B(1,1)

represent the proportion of sucesses observed in a sample proportion of ntrials.

if znB (nip), then the sample proportion == x

Sample Mean is the subset of given population.

The Sample mean is defined as the ang of no servation from the Sample.

Sample Variance

For a sample x...x obtainted from a population Ditu a mean or and a variance of consider fue variance estimate

$$\sigma_{5} = 2 = \sum_{i=1}^{n} (x^{i} - x^{i})_{5}$$

7.4 constructing Paramelor Estimate

If a data set consists of observation xy ... xn from a probability distribution that depends upon one unknown parameter o, the method of moments point estimate of of the parameter is found by Solving the equation.

X = E (x)

Method of Moments point Estimatel for two parameter

X=E(x) and s2= van (x)

Herrimum Liketinood Estimate

Maximum Likelihood Estimate for one parameter

therefore

$$\boxed{\# \quad \Gamma(0) = \coprod_{x=7}^{x=7} f(x,0)}$$

where x= x1+... +xn and the maximum likelihood estimate p is the value that maximizes this.

the log-likehood is

In (1) = x In (p) + (n-x) In (1-p)

and
$$\frac{d \ln U}{d p} = \frac{x}{P} - \frac{h-x}{1-p}$$

$$p^2 = \frac{x}{h}$$

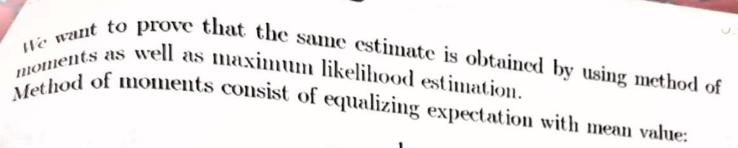
Maximum Likehood Estimate for Parameters.

L (x1.... xn 0x, 02) = f (x1 01, 02) x ... x f (xn, 01, 02)

Example 1: clas, work

Mid Hank & 14, 13, 12.5, 13.5, 13.5~ M (12,4)

f (14.0) xf (13.0) x f (12.5,0) x f (13.5,0) xf (13.5,0)



$$EX = \frac{1}{\lambda} = \overline{x}$$

$$\implies \hat{\lambda} = \frac{1}{x}$$

Maximum likelihood estimation consists of finding $\hat{\lambda}$ that will maximize L:

$$L(\lambda; x_1, x_2, ..., x_n) = \lambda^n \cdot e^{-\lambda \sum_{i=1}^n x_i}$$

It's complicated to find maximum of function L, therefore we will make function lnL. Since ln is increasing function maximum remains the same as in function L.

$$lnL(\lambda;x_1,x_2,...,x_n) = nln\lambda - \lambda \sum_{i=1}^{n} x_i$$

Now it's easy to find value $\hat{\lambda}$ by equalizing first derivate with zero.

$$\frac{\partial lnL(\lambda;x_1,x_2,...,x_n)}{\lambda} = \frac{n}{\lambda} - \sum_{i=1}^n x_i$$

$$\implies \hat{\lambda} = \frac{1}{x}$$

$$E(S^2) = \frac{1}{n-1} E\left(\frac{\eta}{2} (x_i - \bar{x})^2\right)$$

$$=\frac{1}{n-1}E\left(\sum_{i=1}^{n}(x_{i-1})-(x_{i-1})^{2}\right)$$

$$= \frac{u-1}{1-1} E \left(\sum_{j=1}^{j=1} (x^{j}-w)_{5} - 3(x^{j}-w) \sum_{j=1}^{j=1} (x^{j}-w)^{+} \right)$$

$$\times \left[E(x_i) = H = Nan(x_i) = G^2 \right] = \frac{1}{n-1} \left(\sum_{i=1}^{n-1} \binom{n}{2} - n \cdot \binom{n}{2} \right)$$

$$E(x!-w)_{5} = \Lambda \alpha U(x) = Q_{5}$$

$$E(x)=M$$

$$E(x-M)^2 = var(x) = g^2$$

$$=\frac{u-T}{I}\left(\sum_{j=1}^{i=1}C_{j}-u\cdot\left(C_{j}\right)\right)$$