ESTIMATION

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Estimation is concerned with the methods by population characteristics are estimated from sample information. The statistical estimation procedures provide us with the means of obtaining estimates of the population parameter with desired degree of precision.

Two types of estimates are possible. They are-

1. Point Estimates
2. Interval Estimates

Point Estimates:- A Point estimate is a single number which is used as an estimate of the unknown population parameter. In this procedure, a random sample of'n' observation is selected and then some preconceived method is used to arrive from these observation at a number say (Theta hat which is accepted as an estimation of θ(Theta) (Symboll theta is used to denote a parameter that could be mean, median or some measure of variability Etc) Theta depends on the random variables that generate the sample and hence it also is a random variable with its own sampling distribution.

Interval Estimates:- Point estimate provide o0ne single value of the parameter, whereas internal estimate of a population parameter statement of two values between which it is estimated that the parameter lies. An interval estimate is specified by two values, lower and higher. Technically, interval, called the confidence interval with end points L and U. For example, if average income of the people in a city is estimated to be Rs.800, it will be a point estimate but if it is said that the average income could lie between Rs.780 to 830 is called interval estimate.

Properties:

- Properties of Estimators: Bias

U is an unbiased estimator of θ if E(U) = θ. An estimator V is called biased if E(V) is different from θ I Bias ≡ E(V) − θ I Bias is often assessed by characterizing the sampling distribution of an estimator I repeated samples are drawn by resampling from the disturbance term (in our case,), while keeping the values of the independent variables unchanged I For instance we could do this 1,000 times using $\beta *$ to calculate an estimate of β I The way that the 1,000 samples are distributed is called the sampling distribution of $\beta *$ I For an estimator $\beta *$ to be an unbiased estimator of β means that the mean of its sampling distribution is equal to β I Another way to put this is that $E(\beta *) = \beta$

Properties of Estimators: Efficiency I

We would like the distribution of an estimator to be highly concentrated—to have a small variance. This is the notion of efficiency. The efficiency of V compared to W is W ≡ varW varV . I If population being sampled is exactly symmetric, then center can be estimated without bias by either the sample mean $\bar{X}$ or the sample median X 0 . For large samples, varX 0 ≈ 1.57σ 2/n. Since $\bar{X}$ has variance σ 2/n, the smaller variance makes it 157% more efficient than the median for normal populations. I This gives rise to the notion of relative efficiency, to which we will return shortly I Not really the same as "minimum variance"

Properties of Estimators: Consistency

I A consistent estimator is one that concentrates in a narrower and narrower band around its target as sample size increases indefinitely. MSE approaches zero in the limit: bias and variance both approach zero as sample size increases. I V is defined to be a consistent estimator of θ, if for any positive δ (no matter how small), $Pr(|V - \theta|) < \delta) \longrightarrow 1$, as $n \longrightarrow \infty$ I (Kennedy) If the asymptotic distribution of $\hat{\beta}$ becomes concentrated on a particular value k as $N \longrightarrow \infty$, k is said to be the probability limit of $\hat{\beta}$ and is written plim$\hat{\beta}$ = k; if plim$\hat{\beta}$ = β, then $\hat{\beta}$ is said to be consistent Choosing from among alternative estimators I When we compare two unbiased estimators, which should we choose? I Answer: The one with minimum variance I When comparing both biased, and unbiased, which should we choose? I Answer: The one with the best combination of small bias and small variance I Mean Squared Error (MSE): $\equiv E(V - \theta)^2$

Sufficiency:- An estimator is said to be sufficient, it it conveys as much information as possible about the parameter which is contained in the sample.