

Economics 10A

Probability and Statistics in Economics I

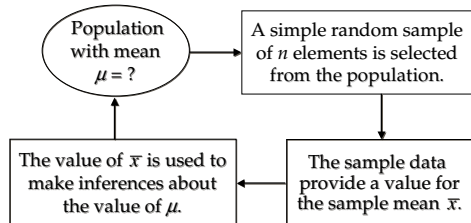
Lecture 12 – Sampling Distribution
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<http://www.researchmethods.org/10a>

Statistical Inference

- ⌘ The purpose of statistical inference is to obtain information about a population from information contained in a sample.
- ⌘ A population is the set of all the elements of interest.
- ⌘ A sample is a subset of the population.
- ⌘ The sample results provide only estimates of the values of the population characteristics.

Statistical Inference Process



Simple Random Sampling

∞ Finite Population

- ☒ A simple random sample from a finite population of size N is a sample selected such that each possible sample of size n has the same probability of being selected.
- ☒ Replacing each sampled element before selecting subsequent elements is called sampling with replacement.
- ☒ Sampling without replacement is the procedure used most often.
- ☒ In large sampling projects, computer-generated random numbers are often used to automate the sample selection process.

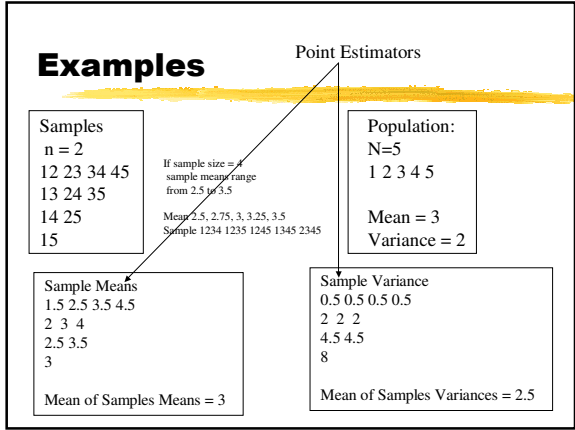
Simple Random Sampling

∞ Infinite Population

- ☒ A simple random sample from an infinite population is a sample selected such that the following conditions are satisfied.
 - ☒ Each element selected comes from the same population.
 - ☒ Each element is selected independently.
- ☒ The population is usually considered infinite if it involves an ongoing process that makes listing or counting every element impossible.
- ☒ The random number selection procedure cannot be used for infinite populations.

Point Estimation

- ∞ In point estimation we use the data from the sample to compute a value of a sample statistic that serves as an estimate of a population parameter.
- ∞ We refer to \bar{x} as the point estimator of the population mean μ .
- ∞ s is the point estimator of the population standard deviation σ .
- ∞ \bar{p} is the point estimator of the population proportion p .



Properties of Point Estimators

⌘ Unbiasedness

If the expected value of the sample statistic is equal to the population parameter being estimated, the sample statistic is said to be an unbiased estimator of the population parameter.

Properties of Point Estimators

⌘ Efficiency

Given the choice of two unbiased estimators of the same population parameter, we would prefer to use the point estimator with the smaller standard deviation, since it tends to provide estimates closer to the population parameter.

The point estimator with the smaller standard deviation is said to have greater relative efficiency than the other.

Sampling Error

- ⌘ The absolute difference between an unbiased point estimate and the corresponding population parameter is called the sampling error.
- ⌘ Sampling error is the result of using a subset of the population (the sample), and not the entire population to develop estimates.
- ⌘ The sampling errors are:
 - $|\bar{x} - \mu|$ for sample mean
 - $|s - \sigma|$ for sample standard deviation
 - $|\bar{p} - p|$ for sample proportion

Sampling Distribution of

- ⌘ The sampling distribution of \bar{x} is the probability distribution of all possible values of the sample mean \bar{x} .
- ⌘ Expected Value of \bar{x}

$$E(\bar{x}) = \mu$$

where:

μ = the population mean

Sampling Distribution of \bar{x}

Standard Deviation of \bar{x}

Finite Population	Infinite Population
$\sigma_{\bar{x}} = \left(\frac{\sigma}{\sqrt{n}}\right)\sqrt{\frac{N-n}{N-1}}$	$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

- A finite population is treated as being infinite if $n/N \leq .05$.
- $\sqrt{(N-n)/(N-1)}$ is the finite correction factor.
- $\sigma_{\bar{x}}$ is referred to as the standard error of the mean.

Sampling in SPSS

- ☞ Click on Data
- ☞ then Select Cases ...
- ☞ select Random Sample of Cases
- ☞ Click on Sample...
- ☞ a window will open for you to specify sample size (can be a percentage or exact number of cases)
- ☞ then click on Continue, back to main Select Cases window
- ☞ then click on OK
