Inferential Statistics

GEORGE HUMPHREY

LEAVING CERTIFICATE HIGHER LEVEL

Inferential statistics is the branch of statistics that uses probability and statistics to draw conclusions from data that are affected by random variation. To work on inferential statistics, we should be able to:

1. Estimate the value of a population proportion
2. Calculate the margin of error for a sample
3. Construct a confidence interval
4. Test a hypothesis about a population proportion
5. Apply sampling theory to hypothesis questions
6. Use p-value as an alternative to hypothesis testing

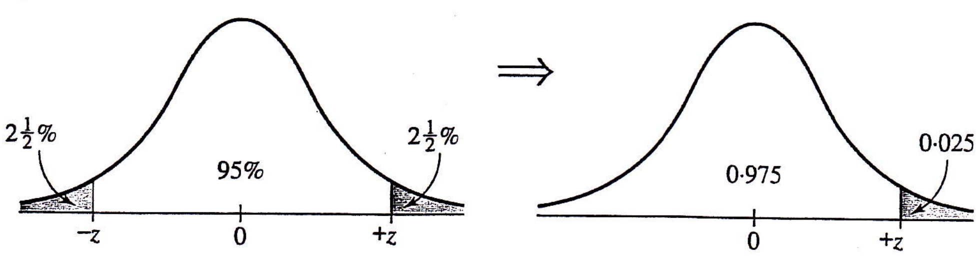
Confidence interval for population proportion using the standard normal tables

How should we summarise the strength of the data in a sample survey? This is where the role of the **standard error (SE) of the proportion,** written $\sigma_{\hat{p}}$, comes in. The standard error is a number that represents the accuracy of a sample survey. It is a statistic expressing the amount of random sampling error in the results of a sample survey. The most commonly used level of confidence is 95%, but others you may meet include 90%, 98% and 99%. On our course, the 95% confidence level for the standard error (SE) is given by

$$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} \quad \text{(see the formulae and tables booklet)}$$

where $\sigma_{\hat{p}}$ is called the **standard error** (SE),
n is the size of the samples where $n \geq 30$
and p is the true proportion of the population (or $\hat{p}$ instead of p if p is unknown).

To calculate the margin of error (ME) at the 95% level of confidence, we need to know the associated z-value from the normal curve.



From the standard normal tables, $z = 1{\cdot}96$.

Now z is the number of standard deviation that the margin of error is from the mean. Thus, the margin of error, E, is given by:

$$E = z\,\sigma_{\hat{p}}$$
$$E = 1{\cdot}96\,\sigma_{\hat{p}}$$

Book:
The cartoon guide to statistics
Gonick & Smith.