Independent vs Dependent Samples

Data Science for Quality Management: Two Sample Hypothesis Testing

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Learning objective:

Discern between samples that are independent and dependent

Two Sample Tests

- Comparing Parameters of Two Populations
- Is the new design of a production part different from the old design?
- Did one group of experimental subjects react differently from the other?

How to Select the Appropriate Test for Two Samples

- Identify the type of data associated with the Criterion Measure of interest:
  - Nominal
  - Ordinal
  - Continuous

How to Select the Appropriate Test for Two Samples

- Determine whether the samples come from Two Independent or Dependent Populations

Independent Samples

- Each item within each sample is independent of each other item

- All the items in each sample (group) are independent of each and every item in the other sample (group)

Independent Samples

- There is no linkage between any of items in each of the two samples (groups)

Dependent Samples

- Each of the items within each sample are independent of every other item in the sample
- Each item (specimen) in one group is linked or related to a corresponding item in the other sample

Dependent Samples

- This linkage dependency can be due to
  - Repeated Measures
  - Matching
  - Pairing

Repeated Measures

- The two sets of data represent repeated measures (pairs of observations) from a single sample (dependent by nature)

Matching / Pairing

- The two samples are dependent by design, based on paired or grouped testing through time, or upon a pretest or covariate.

Independent Example

- An admissions officer of a small college wants to compare the mean standardized test scores of applicants educated in rural high schools & in urban high schools

Dependent Example

- An analyst for Educational Testing Service wants to compare the mean GMAT scores of students before and after taking a GMAT review course

Sources

- Luftig, J. An Introduction to Statistical Process Control & Capability. Luftig & Associates, Inc. Farmington Hills, MI, 1982