
PO91Q - Fundamentals in Quantitative Research Methods

Self-Reflection Questions, Week 4

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1. What does a significance test do?
 - A significance test evaluates whether the observed data provide enough evidence to reject a null hypothesis about a population parameter.
 - It compares the observed statistic to what would be expected if the null hypothesis were true.
 - The result is expressed as a p-value, which shows how likely the observed outcome (or more extreme) would be under the null hypothesis.
 - A small p-value suggests that the observed result is unlikely under the null, leading to its rejection.
2. Give an example of a significance test.
 - Testing whether the mean exam score of a class differs from 70 using a one-sample t-test.
 - Null hypothesis: the true mean score is 70.
 - Alternative hypothesis: the true mean score is not 70.
 - The test uses sample data to calculate a t-statistic and p-value to decide whether to reject the null hypothesis.
3. Give an example of a hypothesis that is not testable.
 - There is an invisible force that controls human destiny.
 - A person's soul determines their success in life.
4. Explain the difference between a significance test and a confidence interval.
 - A significance test assesses whether data provide enough evidence to reject a null hypothesis about a population parameter.
 - A confidence interval estimates a range of plausible values for that parameter based on sample data.
 - The test gives a yes/no decision (via a p-value), while the interval shows both the estimate and its precision.
 - Both rely on the same sampling distribution but express uncertainty differently.

5. Explain the relationship between the significance (or α) level and the Type I and II Errors.
- The significance level (α) is the threshold for rejecting the null hypothesis. It represents the probability of making a Type I error, which occurs when the null hypothesis is incorrectly rejected when it is actually true.
 - A Type II error occurs when the null hypothesis is not rejected when it is false. The probability of making a Type II error is denoted by β .
 - There is an inverse relationship between α and β ; as α decreases, β tends to increase, and vice versa.
 - This means that the smaller we set α , the more likely we are to make Type II errors, and vice versa.