ONE-WAY ANOVA

Step 1. 1. SPECIFY TWO COMPLEMENTARY HYPOTHESES INVOLVING POPULATION-PARAMETERS, NOT SAMPLE-STATISTICS.

H0: 'Null Hypothesis or 'Status-Quo Hypothesis'

H1: 'Alternative Hypothesis' or 'Researcher's Hypothesis', expresses the alternative to the Status-Quo.

Type 1 Error ⟺ Incorrectly, deciding in favor of H1.

Type 2 Error ⟺ Incorrectly, deciding in favor of H0.

Step 1 practical

H_0 says that the population mean cash register receipt is the same at both stores / μ_1= μ_2

H_1 says that the population mean cash register receipt is different at the two stores / μ_1≠ μ_2

Step 2

CHOOSE α = THE SIGNIFICANCE LEVEL OF THE HYPOTHESIS TEST:

α = the maximum allowable probability of a Type 1 Error = the maximum allowable probability of rejecting H0 when H0 is true.

Step 2 PRACTICAL

α = .05. The upper bound on the probability of a Type I Error is set at 5%. Type I Error involves deciding incorrectly that the population-mean cash register receipt is different at the two stores.

Step 3

STATE THE TEST-STATISTIC AND ITS PROBABILITY-DISTRIBUTION:

Specify the Model Assumptions that guaranty the validity of (3),

Specify the Test-Statistic

Specify the Probability-Distribution

Step 3 PRACTICAL

If H0 is true and the Model Assumptions hold:

1. Sampling is Independent and Random

2. Sampling is from Normal Populations

3. The Populations have Equal Variances

MSA/MSW ~ F (1,8)

Step 4

COMPUTATIONS: Complete the sample-based computations, including the p-value. Summarize the results in an ANOVA Table

p-value = Probability of observing evidence more favorable to H1 than that observed in the actual sample = Probability of H0 being true.

Step 4 practical

SAMPLE TOTALS → SAMPLE MEANS → GRAND-MEAN = THE MEAN OF ALL OBSERVATIONS IN ALL SAMPLES → $\bar{\bar{x}}$

SSA ('Sum of Squares Among' Sample Means) measures the variation that exists among (i.e. between) samples

SSA = n1 $(\bar{x}1 - \bar{\bar{x}})^2$ + n2 $(\bar{x}2 - \bar{\bar{x}})$2 = 5(80- 90)^2 = Number of observatios (each mean - grand mean) squared + the other sample

SSW ('Sum of Squares Within' Samples) measures the variation that exists within all the samples.

SSW= (88 - 80)2 + (73 - 80)2 + (77 - 80)2 = (Each observation - the mean) squared + the same for the other sample

The "degrees of Freedom" associated with SSA is: DFA = C – 1 / C=# of samples

The "degrees of Freedom" associated with SSW is: DFW = n – C / n=Total observations

MSA = SSA/(c-1) MSA is a measure of the average amount of separation between sample-means

MSW = SSW/(n - c) / where n = n1 + n2

THE F-STATISTIC: F = MSA/MSW

Larger values of MSA/MSW indicate greater variation among sample-means than between the observations within each sample.

MSA/MSW ~ F (c-1, n-c)

Step 5

5. CONCLUSION: REPORT THE CONCLUSION IN BOTH:

Reject H0 in favor of H1 ⟺ p ≤ α --- or ---

Fail to reject H0 ⟺ p > α

Step 5 PRACTICAL

Since the p-value = . 010619 ≤ . 05 = α we reject H0 in favor of H1.

In practical terms this says - at the 5% significance level, the evidence is sufficient to conclude that the 'population-mean cash register receipt' is different at the two stores

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