

Analysis of Variance (ANOVA)

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Why Use ANOVA

- Effective way to determine whether the means of more than two samples differ significantly or only due to sampling error.
- Possible from t tests also but involve a number of separate tests. If there are 5 groups than 10 t tests will be required in case of one independent variable.

One-Way ANOVA

- Relationship bet. One independent & one dependent variable examined.
- Explain taking example (administration of reasoning/aptitude/general awareness tests to students of Arts, Science, Commerce stream students at +2 level)

Operations of ANOVA

- The analysis of variance consists of these operations:
- The variance of the scores for these groups is combined into one composite group known as the total groups variance (V_t).
- The mean value of the variance of each of the three groups, computed separately, is known as the within-groups variance (V_w).
- The Difference between the total groups variance and the within-groups variance is known as the between-groups variance ($V_t - V_w = V_b$).
- F ratio is computed
$$F = \frac{V_b}{V_w} = \frac{\text{(between - groups variance)}}{\text{(within - groups variance)}}$$

Explaining bet & within Group variances

- Within- groups variance represents sampling error in the distributions (also referred as error variance)
- Between- groups variance represents the influence of variable under consideration (experimental variable)
- If the between groups variance is not substantially greater than the Within groups variance, difference may be sampling error

Significance of F ratio

- df for bet-groups variance = K-1 (K is no. of grs)

- df for within-groups variance = N1 + N2 + ... - K
- $$F = \frac{V_b}{V_w} = \frac{\text{(between - groups variance)}}{\text{(within - groups variance)}}$$

$$F = \frac{MS_b}{MS_w}$$

Discussion on Shown Sample data

- Discuss the sample data taken as example
- The calculated F in the example shows 3 groups differ significantly.
- But does not pin point exactly where the differences are in a pair-wise way.
- These can also be answered. (post hoc analyses)