Quadrant II - Notes

Programme: Bachelor of Arts (Second Year)

Subject: Economics

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Paper Title: Data Analysis-II

Unit: 4

Module Name: Multivariate One-Way Analysis of Variance Model

Module No: 18

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Meaning and Working of MANOVA

MANOVA (multivariate analysis of variance) is an extension of univariate analysis of variance (ANOVA).

it uses the covariance between outcome variables in testing the statistical significance of the mean differences.

In an ANOVA, we use an independent grouping variable to look for statistical differences on one continuous dependent variable.

The MANOVA expands on this analysis by considering numerous continuous dependent variables and grouping them into a weighted linear combination or composite variable.

The MANOVA will determine whether the newly constructed combination differs from the independent variable's different groups, or levels.

The MANOVA basically checks whether the independent grouping variable simultaneously explains a statistically significant amount of variance in the dependent variable.

Type of Questions that MANOVA can answer

1) Do the various school assessments differ depending on the student's grade level?

2) Is there a difference in graduation rates between degree types at different state universities?

3) Which diseases are better treated by X medicine or Y drug, if at all?

Assumptions of MANOVA

The following assumptions are made when using a MANOVA.

1. The response variables are continuous.

2. The residuals follow the multivariate-normal probability distribution with means equal to zero.

3. The variance-covariance matrices of each group of residuals are equal.

4. The individuals are independent.

Advantages/Benefits of MANOVA

To begin, we can investigate any interactions between the variables.

Second, analyzing two or more variables at the same time improves the model's efficiency.

Finally, when more factors are included in the study, the residual variation in the model is reduced.

MANOVA is particularly effective in experimental research when independent factors are being manipulated.

Furthermore, because multiple aspects are investigated simultaneously, it is easier to establish which are the most significant.

Additionally, MANOVA decreases the risk of Type 1 error that would occur if multiple ANOVA were employed, as well as assisting in the finding of differences that might otherwise go undetected using ANOVA.

Limitations of MANOVA

When there is a lot of interaction between factors, MANOVA is more complex than ANOVA and might cause challenges with interpretation and analysis.

Also, one degree of freedom is lost for each additional element evaluated (Loss of Degrees of Freedom).

Outliers (observations that are abnormally far off from other values in a random sample from a population) have a detrimental impact on MANOVA Analysis.

It is difficult to test the assumption of Multivariate Normal Distribution.

For evaluating normalcy, many researchers use univariate tests, which may or may not produce good results.