

Week-06-L-03

Agricultural Statistics in Practice

Multivariate Analysis

Factor Analysis and its Types

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Factor Analysis

20 variables

→ 6 factors

- Factor analysis is a technique that reduces a large number of variables into a smaller set of factors.
- It captures the shared variance among variables and creates a common score for further analysis.
- It is a component of the general linear model and assumes linear relationships among variables.
- Factor analysis helps to identify underlying factors and their impact on the data.



Objectives

- Determine the optimal number of factors needed to explain common themes in a variable set.
- Assess the relationship between each variable in the dataset and the common factors.
- Interpret the meaning and significance of the identified common factors.
- Evaluate the degree to which individual data points reflect the underlying themes or factors.



Types

$F_1 \leftarrow 4$ (✓)
 $F_2 \leftarrow 3$
 $F_3 \leftarrow 2$
 $F_4 \leftarrow 3$
 $F_5 \leftarrow 4$
 $F_6 \leftarrow 4$ / 20

- **Confirmatory Factor Analysis:** (CFA)
- Determines the relationship between factors or variables in a dataset.
- Evaluates if data aligns with a specific hypothesis or theory.
- Tests constraints imposed on a model and confirms the presence or absence of relationships.
- Focuses on confirming connections between observed variables and underlying factors.



Types

- **Exploratory Factor Analysis:**
- Aims to uncover the latent structure within a large set of variables.
- Identifies relationships between measured variables in a dataset.
- Does not rely on pre-defined hypotheses or theories.
- Focuses on revealing connections between different variables in the dataset.



Methods

- ✓ **Principal Component Analysis (PCA):** It extracts factors based on highest variances, sequentially removing variance determined by each factor.
- ✓ **Image Factoring:** Relies on the correlation matrix and utilizes the OLS Regression method to predict the factor. *Ordinary Least Square*
- **Common Factor Analysis:** Removes common variance and assigns it to factors, useful in Structural Equation Modeling (SEM) and does not include unique variances.
- **Maximum Likelihood Factor:** Extracts factors based on the correlation metric, with a focus on determining the maximum likelihood of the factor.

Thank You

