# TRINITY COLLEGE FOR WOMEN NAMAKKAL

## Department of Mathematics

## Advanced Business Statistics

## 19PCM07-Even semester


**Presented by**

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# Multivariate Analysis:

MVA is a statistical procedure for analysis of data involving more than one type of measurement or observation. It may also mean solving problems where more than one dependent variable is analyzed simultaneously with other variables.

# Types of MVA:

- Analysis of dependence
- Analysis of interdependence

# Principle Components Of MVA:

1. Identify underlying dimensions or principal components of a dimension or
principal components of a distribution.

2. Helps understand the joint or common variation among the set of variables.

3. Probably most commonly used method of deriving “factors” in factor analysis.

## Example:

Determining the value of an apartment factors possibly related to the value are size of the apartment, age of the building, number of bathrooms [eg. Floor,view etc.,]

# Partial Correlation:

Partial correlation measures relationship between two variables (X,Y) while eliminating the influence of third variable Z.

# Formula:

$$r_{yx.z} = \frac{r_{yx} - (r_{yz})(r_{xz})}{\sqrt{1 - r_{yz}^2}\sqrt{1 - r_{xz}^2}}$$

# Problem:

| Small Cities (Z = 1) | | Medium Cities (Z = 2) | | Large Cities (Z = 3) | |
|---|---|---|---|---|---|
| Churches (X) | Crimes (Y) | Churches (X) | Crimes (Y) | Churches (X) | Crimes (Y) |
| 1 | 4 | 7 | 8 | 13 | 15 |
| 2 | 3 | 8 | 11 | 14 | 14 |
| 3 | 1 | 9 | 9 | 15 | 16 |
| 4 | 2 | 10 | 7 | 16 | 17 |
| 5 | 5 | 11 | 10 | 17 | 13 |

# Multiple Correlation:

1. The multiple correlation coefficient denoting a correlation of one variable with the multiple other variables.

2. It is a measure of how well a given variable can be predicted using a linear function of a set of other variables.

# Formula:

The formula for $R$ is

$$R = \sqrt{\frac{r_{yx_1}^2 + r_{yx_2}^2 - 2r_{yx_1} \cdot r_{yx_2} \cdot r_{x_1x_2}}{1 - r_{x_1x_2}^2}}$$

# Example:

Given that $r_{21} = 0.7$, $r_{23} = 0.85$ and $r_{13} = 0.75$, determine $R_{2.13}$

**Solution:**

We have $$R_{2.13} = \frac{\sqrt{r^2_{21} + r^2_{23} - 2\, r_{21}\, r_{23}\, r_{13}}}{\sqrt{1 - r^2_{13}}}$$

$$= \frac{\sqrt{(0.7)^2 + (0.85)^2 - 2 \times 0.7 \times 0.85 \times 0.75}}{\sqrt{1 - (0.75)^2}}$$

$$= \frac{\sqrt{0.49 + 0.7225 - 0.8925}}{\sqrt{1 - 0.5625}}$$

$$= \frac{\sqrt{1.2125 - 0.8925}}{\sqrt{0.4375}}$$

$$= \frac{\sqrt{0.32}}{\sqrt{0.4375}}$$

$$= \sqrt{0.7314}$$

$$= 0.8552$$

# Regression:

1. A regression is a statistical analysis assessing the average association between two variables (one dependent variable and one independent variable).

2. It is used to find a relationship between two variables.

# Formula:

General form: $Y = a + bX + e$

"Y" is the dependent variable

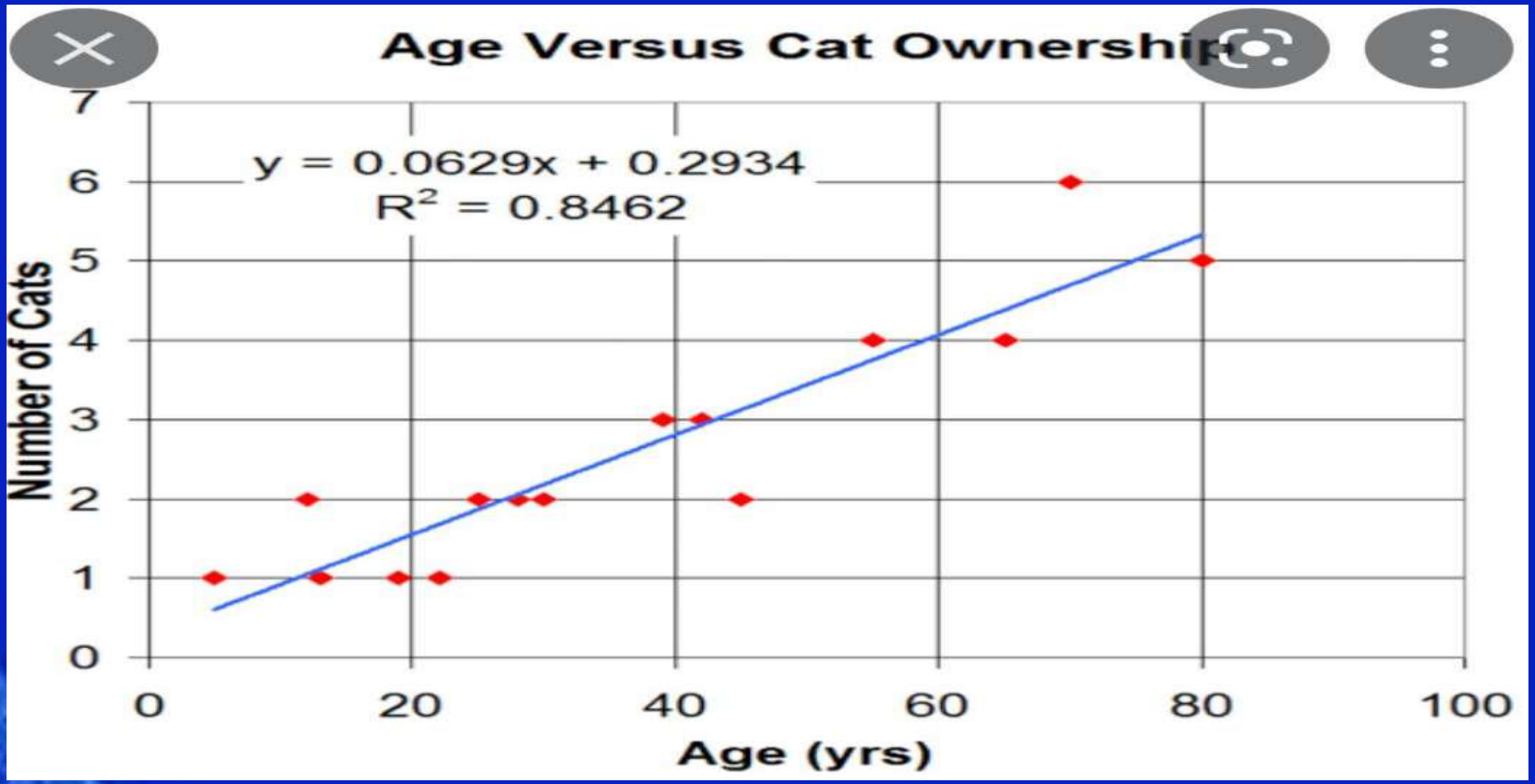
"X" is the explanatory variable

"a" is the intercept parameter

"b" is the slope parameter

"e" is an error term or residual

# Problem:


Age Versus Cat Ownership
y = 0.0629x + 0.2934
R² = 0.8462
Number of Cats
0
1
2
3
4
5
6
7
0
20
40
60
80
100
Age (yrs)

# Factor Analysis:

1. A statistical approach that can be used to analyze interrelationship among a large number of variables and explain these variables in terms of their common underlying dimension(factor).

2. It provides a tool for analyzing the structure of interrelationship(correlation) among variables by defining a set of variables which are highly correlated known as factors.

# Types of Factor Analysis:

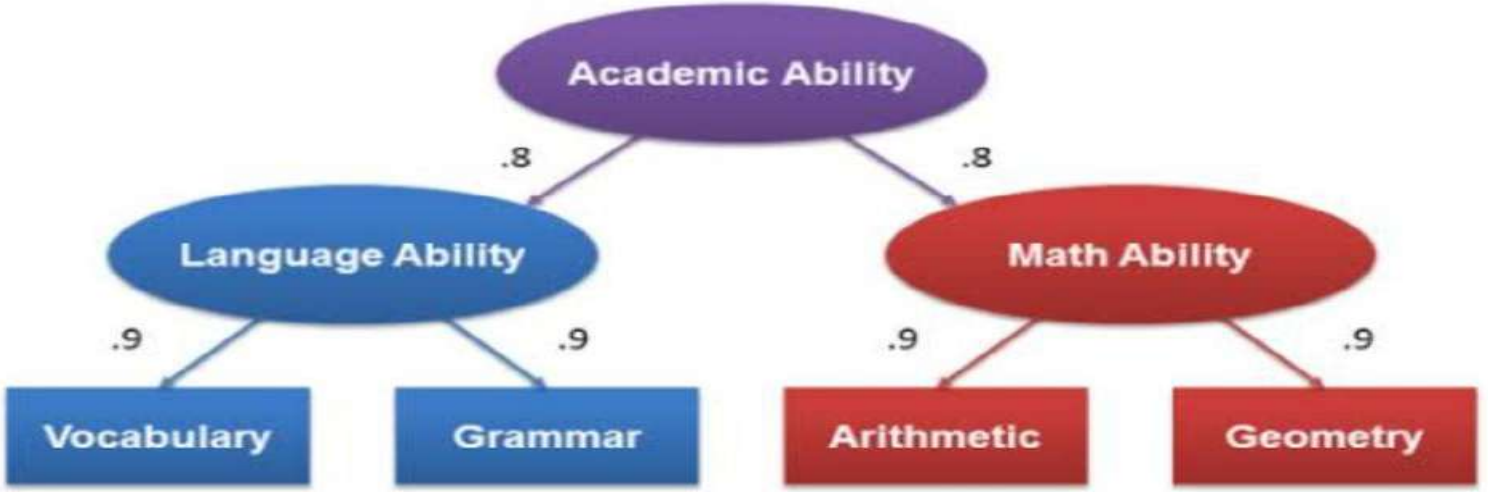
1.Exploratory factor analysis

2.Confirmatory factor analysis

# Example:

## Hierarchical Model

| | Vocabulary | Grammar | Arithmetic | Geometry |
|---|---|---|---|---|
| Vocabulary | | | | |
| Grammar | .81 | | | |
| Arithmetic | .52 | .52 | | |
| Geometry | .52 | .52 | .81 | |



# THANK YOU

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