



# QUANTITATIVE METHODS

MODULE CODE: BIT 125



# WELCOME



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TEXAS COLLEGE MANAGEMENT AND IT

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## CHAPTER 11

### CORRELATION AND REGRESION ANALYSIS

- ☐ Introduction
- ☐ Correlation analysis
- ☐ Various methods of calculating correlation coefficient
- ☐ Regression analysis

5 Lecture Hours

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## Introduction

- Two variables are said to be correlated if the change in one variable results in a corresponding change in the other variable.
- The correlation is a statistical tool which studies the relationship between two variables.
- Correlation analysis involves various methods and techniques used for studying and measuring the extent of the relationship between the two variables.
- Correlation is concerned with the measurement of “*strength of association between variables*”.
- The degree of association between two or more variables is termed as correlation.
- Correlation analysis helps us to decide the strength of the linear relationship between two variables.

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- The word correlation is used to decide the degree of association between variables.
- If two variables 'x' and 'y' are so related, the variables in the magnitude of one variable tend to be accompanied by variations in the magnitude of the other variable, they are said to be correlated.
- Thus, correlation is a statistical tool, with the help of which, we can determine whether or not two or more variables are correlate and if they are correlated, what is the degree and direction of correlation.

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## Definition

Correlation first developed by Sir Francis Galton (1822 – 1911) and then reformulated by Karl Pearson (1857 – 1936)

The correlation is the measure of the extent and the direction of the relationship between two variables in a bivariate distribution.

Example:

- (i) Height and weight of children.
- (ii) An increase in the price of the commodity by a decrease in the quantity demanded.

Types of Correlation: The following are the types of correlation

- (i) Positive and Negative Correlation
- (ii) Simple, Partial and Multiple Correlation
- (iii) Linear and Non-linear Correlation

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## i. **Positive and Negative correlation:**

If both the variables are varying in the same direction i.e. if one variable is increasing and the other on an average is also increasing or if as one variable is decreasing, the other on an average, is also decreasing, correlation is said to be positive. If on the other hand, the variable is increasing, the other is decreasing or vice versa, correlation is said to be negative.

Example 1:

- a) heights and weights
- (b) amount of rainfall and yields of crops
- (d) income and expenditure on luxury goods
- (e) blood pressure and age

Example 2:

- a) price and demand of commodity
- (b) sales of woolen garments and the days temperature.

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## ii. **Simple, Partial and Multiple Correlation:**

When only two variables are studied, it is a case of simple correlation. In partial and multiple correlation, three or more variables are studied. In multiple correlation three or more variables are studied simultaneously. In partial correlation, we have more than two variables, but consider only two variables to be influencing each other, the effect of the other variables being kept constant.

## iii. **Linear and Non-linear Correlation:**

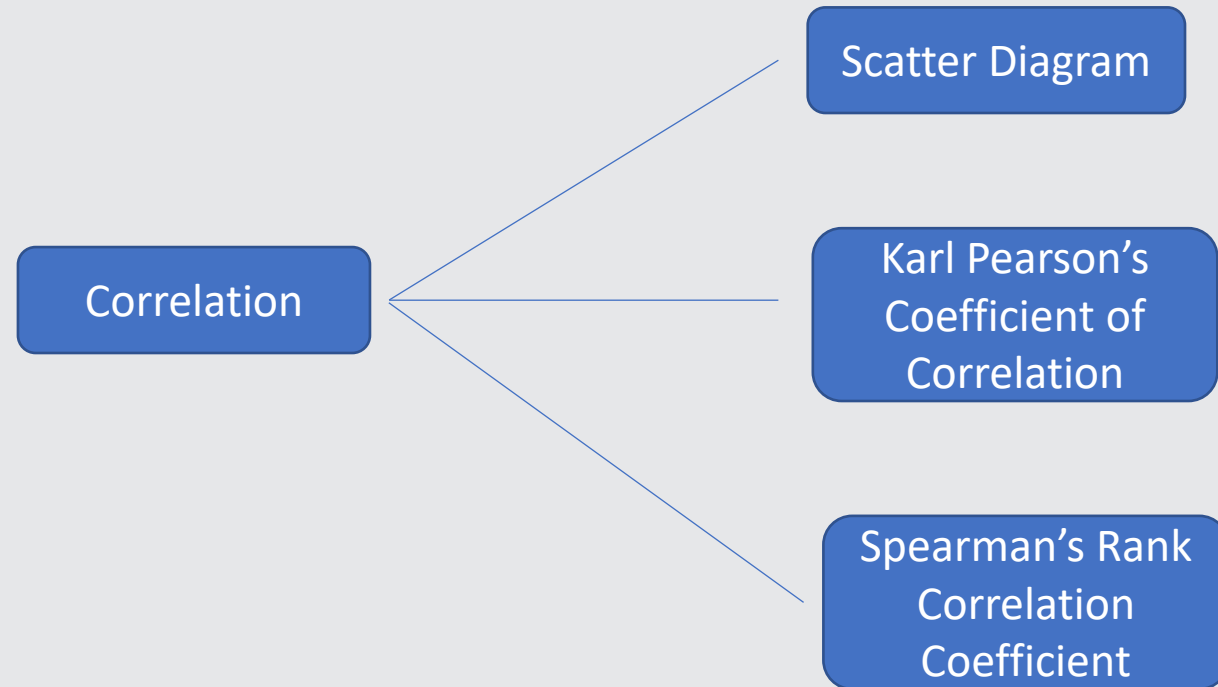
If the change in one variable tends to bear a constant ratio to the change in the other variable, the correlation is said to be linear. Correlation is said to be nonlinear if the amount of change in one variable does not bear a constant ratio to the amount of change in the other variable.



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## Methods of Studying Correlation



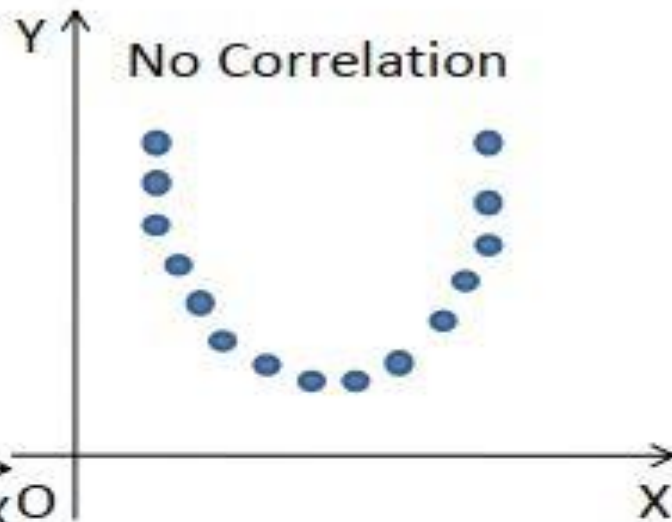
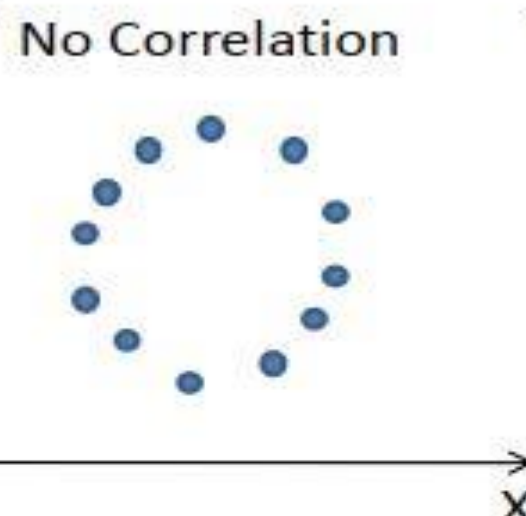
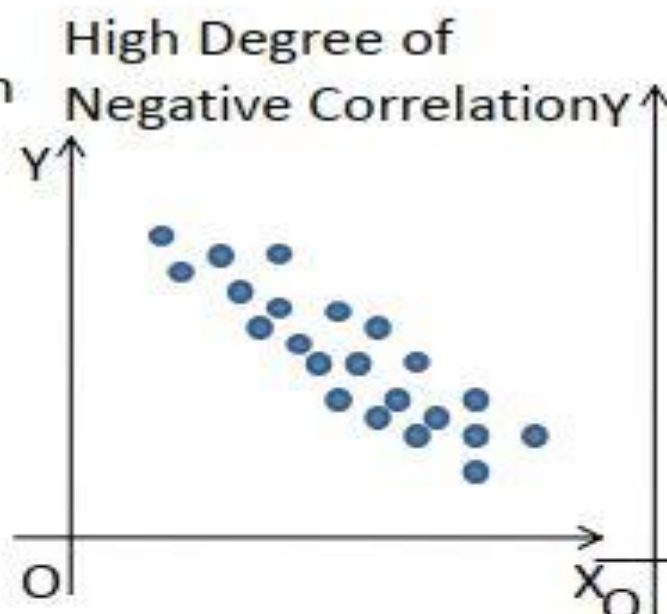
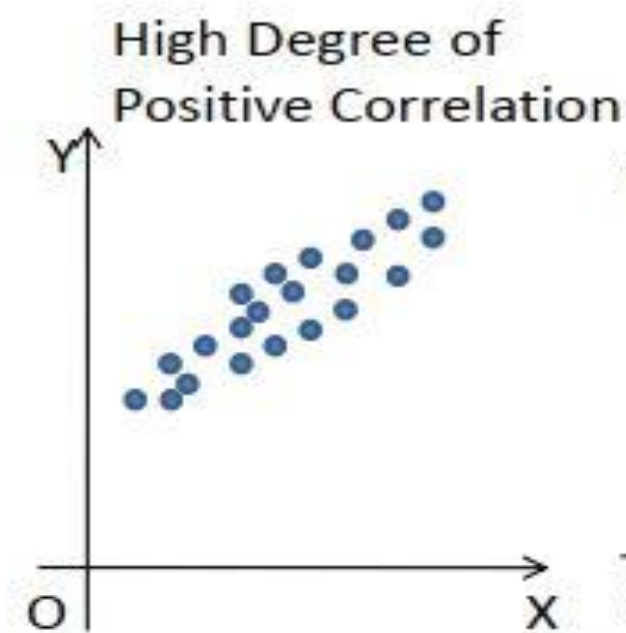
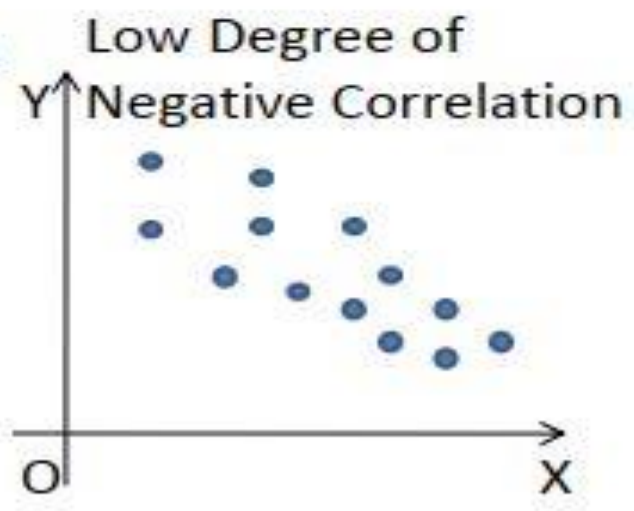
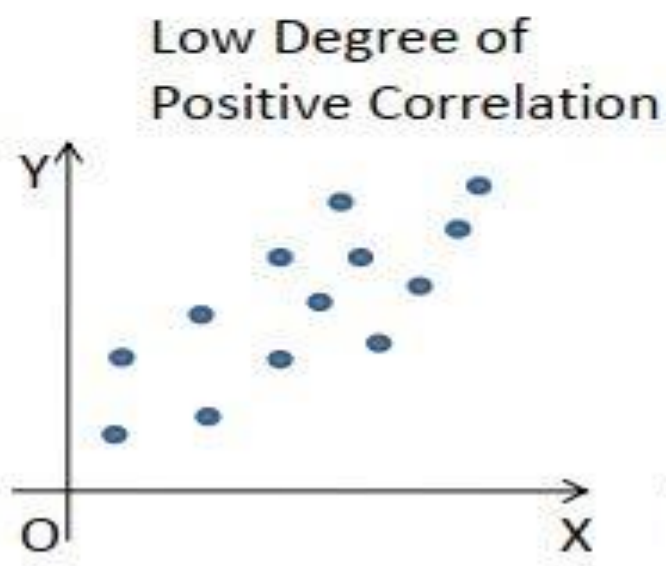
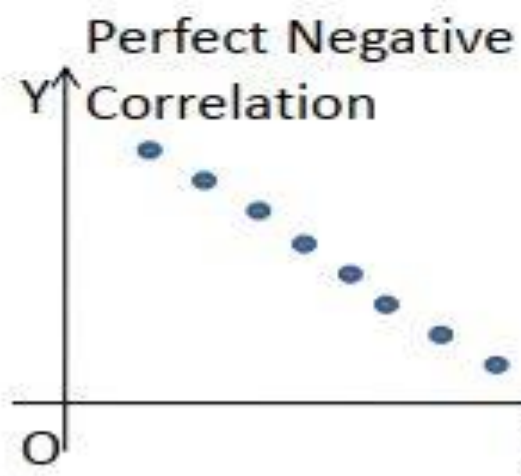
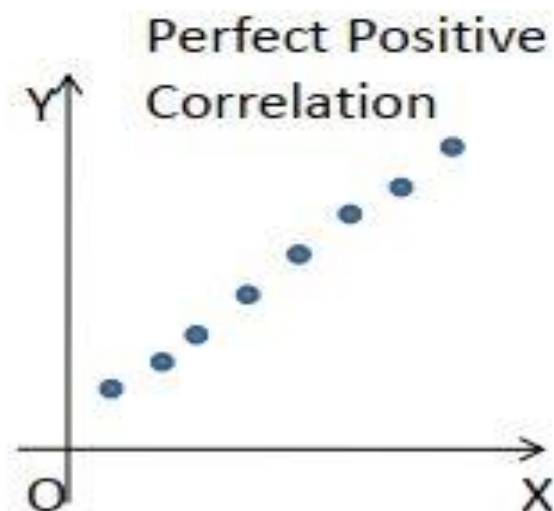
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## **SCATTER DIAGRAM:**

- This is a graphic method of finding out relationship between the variables.
- Given data are plotted on a graph paper in the form of dots i.e. for each pair of  $x$  and  $y$  values we put a dot and thus obtain as many points as the number of observations.
- The greater the scatter of points over the graph, the lesser the relationship between the variables.

# Scatter Diagram



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## INTERPRETATION

- If all the points lie in a straight line, there is either perfect positive or perfect negative correlation.
- If all the points lie on a straight falling from the lower left hand corner to the upper right hand corner then the correlation is perfect positive.
- Perfect positive if  $r = + 1$ .
- If all the points lie on a straight falling from the upper left hand corner to the lower right hand corner then the correlation is perfect negative.
- Perfect negative if  $r = -1$ .
- The nearer the points are to be straight line, the higher degree of correlation.
- The farthest the points from the straight line, the lower degree of correlation.
- If the points are widely scattered and no trend is revealed, the variables may be un-correlated i.e.  $r = 0$ .

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## **The Coefficient of Correlation:**

- A scatter diagram give an idea about the type of relationship or association between the variables under study. It does not tell us about the quantification of the association between the two.
- In order to quantify the relation ship between the variables a measure called correlation coefficient developed by Karl Pearson.
- It is defined as the measure of the degree to which there is linear association between two intervally scaled variables.
- Thus, the coefficient of correlation is a number which indicates to what extent two variables are related , to what extent variations in one go with the variations in the other

## INTERPRETATION



Size of Correlation	Interpretation
.90 to 1.00 (−.90 to −1.00)	Very high positive (negative) correlation
.70 to .90 (−.70 to −.90)	High positive (negative) correlation
.50 to .70 (−.50 to −.70)	Moderate positive (negative) correlation
.30 to .50 (−.30 to −.50)	Low positive (negative) correlation
.00 to .30 (.00 to −.30)	negligible correlation