# BUSINESS STATISTICS

**( For Undergraduate Classes )**

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## PREFACE

This Text Book "**Business Statistics**" is specially prepared for Undergraduate Students. It is prepared in accordance with syllabus given in this book. Needless to say, only my experience in teaching Business Statistics and Mathematics for B.Com. and BBM for some years, prompted me to do this attempt. I do not claim any orginality in the subject matter of this book. I have drawn immense material from many standard Books on this subject. Yet this book is original in the exposition and presentation of the subject matter.

I thank my family members specially my husband and children for their whole hearted support and encouragement.

I sincerely thank United Publishers,Mangalore for bringing out this book and their co-operation and support.

I shall consider my efforts amply rewarded if this book is found useful to the teachers and students.

Suggestions for further improvement for the same solicited.

**Dr. Sudha N. Vaidya**

**Mangalore**

## Syllabus

**Unit 1 : Introduction to Statistics :** Definitions - functios and limitations - primary data - method of collection, secondary data and sources - Classification - Prequency Distribution- Types of series Tabulation - Types- Tabulation - Blank tables - Diagrammetical presentation - Bar Diagram- Frequency graphs- histogram and ogives 12 **hours**

**Unit 2 : Measures of Central Tendency :** Mean, Median, Mode, Geometric Mean and Harmonic Mean - their merits demerits and uses; Measures of dispersion - Range, Quartile deviation, Mean deviation and Standard deviation- their relative measures (coefficients) - Exploratory data analysis - The stem and leaf chart - Box plot chart. **12 hours**

**Unit 3 : Correlation Analysis :** Meaning and types - Karl Pearson's Correlation and Spearman's Rank correlation coefficient (with and without ties) - Regression analysis - Meaning - regression equations- properties of regression coefficients-estimation using regression equations. **12 hours**

**Unit 4 : Time Series :** Components - studying trend by moving averages and method of least squares (linear trend only)Merits and demerits of these methods; Index Numbers - Price Index Number - Laspeyre's, Paasche's and Fisher's index numbers - Consumer price index number - Linear Programming - Formulation - Solving LPP by graphical method. **12 hours**

**Total hours 48**

**CONTENTS**

# UNIT - I INTRODUCTION TO STATISTICS

The word 'statistics' have been derived from the Latin word 'Status' or the Italian word 'Stato', which means political state. Statistics originated because of the administrative requirements of the state. In olden days the royal governments used to collect the information regarding the population, economic wealth etc, to device various military and physical policies. Statistics originated from the administrative requirements of the state. Later entered almost all the fields and it is considered as science of statecraft. Today statistics regarded as one of the most important tools for taking decisions in the midst of uncertainity. In fact, there is hardly any branch of science today that does not make use of statistics. The two factors responsible for the development of statistics the modern times. 1) Increased demand for statistics and 2) Decreasing cost of statistics.

**Definition:**

The word statistics defined by different people under different senses. Some defined statistics as "Just as a set of figures". Others defined statistics "as something that is used to support qualitative statement.

**Concrete Definitions:**

Webster defined statistics as "the classified facts representing the condition of the people in a state.... specially those facts which can be stated in numbers or in tables of numbers or in any tabular or classified arrangements". Bowley defines "statistics are numerical statement of facts in any department of enquiry placed in relation to each other".

Statistics being used both as a singular noun and a plural noun. As a plural noun, it stood for 'data' while as a singular noun, it represented a method of study based on analysis and interpretation of facts.

Statistics as a data or Plural sense defined by Prof. Horace Secrist. He has defined statistics as follows.

"By statistics we mean aggregate of facts affected to a marked extent by multiplicity of causes, numerically expressed enumerated or estimated according to reasonable standards of accuracy, collected in a systematic manner for a pre-determined purpose and placed in relation to each other".

This definition clearly points out certain characteristics of statistics.

1. **Statistics are aggregate of facts:** Single or isolated figures are not statistics for the simple reason that such figures are unrelated and cannot be compared. Eg.: Smitha scored 80 marks in statistics cannot be statistically analysed. On the other hand if we know the marks of 60 students of a class, we can find out average, variation etc.
2. **Statistics are affected to a marked extent by multiplicity of causes.** For example statistics of production of rice are affected by the rainfall quality of seeds, soils, manure method of cultivation etc.
3. **Statistics numerically expressed:** All statistics are numerical statement of facts. Qualitative statement like "price increases with failure of crops" cannot he called statistics.
4. **Statistics are enumerated estimated according to reasonable standard of accuracy:** The degree of accuracy differs from purpose to purpose. For eg.: measuring the height in cm. and weight in kgs.
5. **Statistics are collected in a systematic manner:** The facts should be collected according to planned and scientific methods. Otherwise, they are likely to be wrong and misleading.
6. **Statistics are collected for a pre-determined purpose:** The purpose of collecting data must be decided in advance. The purpose should be will defined and specific.
7. **Statistics should be placed in relation to each other:** The facts must be placed in such a way that a comparative and analytical study becomes possible. Thus, only related facts which are arranged in logical order can be called statistics.

**Statistics in the Singular Sense :**

Seligman "Statistics is the science which deals with methods of collecting, classifying, presenting, comparing and interpreting numerical data collected to throw same light on any sphere of inquiry".

**Croxtan and Cowden Have Given:**

Comprehensive definition of statistics. According to them "Statistics may be defined as the collection, presentation, analysis and interpretation of numerical data".

According to the above definition, there are five stages in a statistical investigation.

1. **Collection of data:** Constitutes the first step in statistical investigation. The data may be collected by the investigator himself or can be obtained from published or unpublished sources.
2. **Classification:** It means organising the collected data. The object is to arrange the items constituting the data.
3. **Presentation:** Data presented in an orderly manner facilitate statistical analysis. Data may be presented in the form of (a) Statistical tables (b) Diagrams and graphs.
4. **Analysis:** Methods used in analysing are numerous. eg.: measures of central tendency, measures of variation, correlation, regression etc.,
5. Interpretation of the data means drawing conclusions from the data collected and analysed.

**Functions of Statistics:**

1. To present facts in definite form. One of the most important use of statistics is to present general statements in a precise and a definite form. For eg.: the statement that average yield of 100kg of sugar cane per hectare in Karnataka is more convincing than simply stating higher or lower yield.
2. It reduces the complexity of the data by reducing bulky data into few significant numbers.
3. **Helps to compare:** Comparison is one of the main functions of statistics. Statistics helps in comparing the data. With respect to time and location it also help us to compare one Phenomenon with the other.
4. **It Enalarges Individual experiences:** Statistics enlarges human knowledge and experience. In statistical study vague and indefinite ideas become clear and definite. It is master key to solve the problems of human life.
5. **Formulations and Tests hypothesis:** Statistical methods are helpful to develop new theories. It is also helpful in formulating and testing hypothesis. For eg: we can verify the law of supply with the help of statistics.

6. **It guides in the formulation of policies and helps in planning:** Planning and policy making by the government is based on statistics of production, demand etc.,
7. **It indicates trends and tendencies:** The statistical technique for extra polation in highly useful for forecasting future events. It helps in forecasting the future tendency.
8. **Studies the Relationship:** The extent of relationships between different data can be measured. Coefficient of correlation, coefficient of correlation, regression etc. are measured through which the measure the functional relationship.
9. **Helps to government:** The government use statistics to have an understanding before implementing the schemes. The use of statistical data and statistical techniques is so wide that almost all ministries departments have separate statistical units. Thus there is a great need of statistics in the affairs of the state.

**Limitations of Statistics:**

1. Statistics does not deal with individual items. it deals with groups or aggregates only.
2. Statistics deals with quantitative data only. Qualitative aspects like efficiency, intelligence are not taken into consideration.
3. Statistics may mislead to wrong conclusion. If data may not be collected properly or collected for some other purpose. We may arrive at wrong or false conclusions.
4. **Statistical results are true only an average:** Statistical results are true only on the average. eg.: Average marks of the class 75, it does not mean that marks of all the students 75. It is only the average marks of the class.
5. Statistics is only one of the methods of studying problem. Statistical tools do not provide the best solution under all circumstances. Statistics are the means and not a solution to the problem.
6. **Statistics can be misused:** The greatest limitation of statistics is that they are liable to be misused. The misuse of statistics may arise because of several reasons. for eg.: If statistical conclusions are based on incomplete information one may arrive at false conclusions. Also statistics cannot be used to full advantage in

the absence of good understanding of the subject to which it is applied.

7. **Distrust of Statistics:** By distrust of statistics we mean lack of confidence in statistical statements and statistical methods. It is commented that "statistics can prove anything" Statistical figures some time manipulated. Statistical tools are most dangerous in the hands of inexperts. Statistics is only a tool if it is used properly it give a wonderful results. If it is misused it gives disasters results.

**Scope of Statistics :**

Statistics is a tool in the hands of man kind to translate complex facts into simple and understandable statement of facts. Since the end of the 19th century the theory of statistics has improved remarkably, due to universal applicability and use, the science of statistics has grown immeasurably. It is impossible to find any sphere of human activity, where statistics does not creep in.

1. **Statistics in States :** Statistics is essential for a country. It supplies essential information to run a government. The aim of every state is to promote the welfare of the people. The state may accept or reject a policy on the basis of statistics. Periodical collection of data relating to population, national wealth, agriculture, exports imports education, etc. are the main guidelines to the government for a good administration. All the departments of government depend upon statistics for efficient functioning. The main collection of statistics in India on the central statistical organisation, National sample survey organisation etc.
2. **Statistics in Economics :** Statistics is an indispensable tool in all the aspects of economic study. The problem in economics cannot be studied without the use of statistics. Various lows of economics can be tested as to their correctness, by analysing the collected data. Economic theories and hypothesis can he tested with the help of statistical tools.
3. **Statistics in Planning :** Modern age is age of planning. Today efficient planning is a must for almost all countries. Various plans that have been prepared for the economic development of a country have also made use of statistical material available about various economic problems. Preparation of detailed plans without the assistance of statistics is just unthinkable.