Economics

(Statistics)

Chapter 1: Introduction To Statistics

Introduction To Statistics

Important terms and concepts –

- **Statistics** simply means numerical data, and is field of math that generally deals with collection of data, tabulation, and interpretation of numerical data. It is actually a form of mathematical analysis that uses different quantitative models to produce a set of experimental data or studies of real life. It is an area of applied mathematics concern with data collection analysis, interpretation, and presentation. Statistics deals with how data can be used to solve complex problems. Some people consider statistics to be a distinct mathematical science rather than a branch of mathematics.

- **Economics** is a science that studies human behavior which aims at allocation of scarce resources in such a way that consumer can maximise their satisfaction, producers can maximise their profits and society can maximise its social welfare. It is about making choice in the presence of scarcity.

- **Scarcity** means shortage of goods and resources in relation to their demand.

Scarcity is the root of all Economic problem -

- **Father of Economics Adam Smith provided wealth definition of economics(Book- The Wealth of Nations, 1776):-** Economics is an enquiry into the factors that determine the wealth of a country.

- **Scarcity definition given by Lionel Robbins(1932):-** Economics is a science that studies human behaviour as a relationship between ends and scarce means which have the alternative uses.

- **Growth definition given by Paul A samuelson:-** Economics is the study of how man and the society chooses with or without the use of money, to employ scarce productive resources which could have the alternative uses to provide various commodities overtime and distribute them for consumption now and in future among various people and the groups of the society.

  Resources are:

  1. Scarce/limited and
  2. Have alternatives uses

Types of Activities -

- **Economic Activities**
  - Production
  - Consumption
  - Investment
  - Exchange
  - Distribution
- **Non-Economics Activities**
  - Social
  - Religious
  - Political
  - Charitable
  - Parental

- **Economic activities** are those activities which are related to earn money and wealth for life. These activities generate new income and increase the flow of goods and services. For example production, consumption, investment, distribution.
- **Non-economic activities** are those activities which are not related to earn money and wealth. These activities neither generate income nor increase the flow of goods & services. For example, a teacher teaching his own son.
- **Consumer:** Consumer is an economic agent who buys the goods and services to satisfy his wants.
- **Producer** is one who produces goods and services for the generation of income.
- **Service holder:** A person who is in job and gives his services as a factor of production and is getting paid for it. E.g. Govt. Teacher.
- **Service Provider:** A person who provides services to other for a payment. e.g. transporter, auto driver.
- **Statistics:** Statistics is a method of taking decisions on the basis of numerical

data.

Statistics can be defined in two ways –

- **Singular sense:** Statistic Means Statistical methods and techniques related to collection, organisation, classification, Presentation, analysis and Interpretation of data.
- **Plural Sense:** Statistics means Numerical facts and figures Which have been systematically collected for a definite purpose in any field of study.

Characteristics of statistics in plural sense -

- Aggregate of facts
- Numerically expressed
- Affected by multiplicity of causes
- Reasonable accuracy
- Collected in a systematic manner
- Pre-determined Purpose
- Placed in relation to each other

Stages of statistics in singular sense -

- Collection of data
- Organisation of data
- Presentation of data
- Analysis of data
- Interpretation of data

Statistical data -

- **Qualitative data:** Not measured in numerical terms like beauty and intelligence.
- **Quantitative data:** Measured in numerical terms like price and Income.

Scope of Statistics -

In the old days, the use of statistics was restricted to deal with the affairs of the state. But now-a-days the scope of statistics has spread to all those areas where numerical facts are used such as economics, business industry, medicine, physics, chemistry and numerous other fields of knowledge.

Importance of Statistics in Economics -

- It enables an economist to present economic facts in precise and definite form.
- Helps in condensing mass data info a few numerical measures.
- Statistics is used in finding relationship between different economic factors.
- Economics forecasting through statistical studies.
- Helpful to formulate appropriate economic policies that solve economic problems.
- Help to analyse the performance of policies applied before.
- Economist try to find out cause and effect relationship between different sets of data.
- Formulation of policies.
- Used for inter-sectoral and inter-temporal comparisons.
- It is a quantitative expression for economic problem.

Function of Statistics

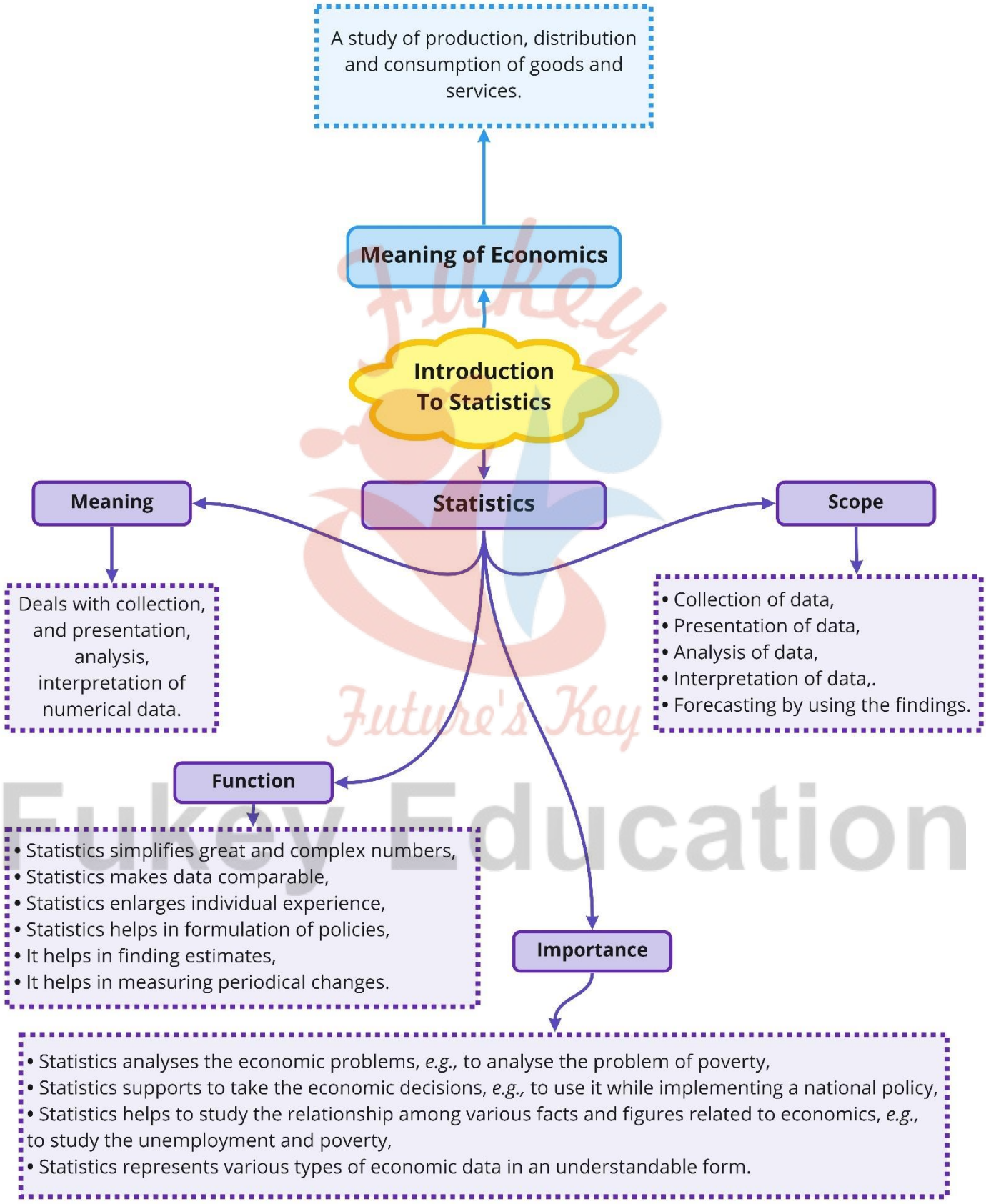
- Statistics simplifies complexities.
- It expresses facts in numbers.
- It presents data in condensed form.
- Statistics compares different phenomena and reassures relationship between them.
- Statistics is helpful information of policies.
- Statistics is helpful in economic forecasting.

- It facilitates comparisons.
- It is useful in testing the laws of other sciences.
- It helps in establishment of correlation between two facts.

Limitations of Statistics

- Statistics does not study individuals.
- Statistics results might lead to fallacious conclusions.
- Statistics deals with quantitative facts only.
- Statistics laws are true only on averages.
- Only experts can make the best possible use of statistics.
- Uniformity and homogeneity of data is essential.
- Misuse of statistics is indeed its greatest limitation because misuse of statistics is possible.
- Study of aggregates only
- Without reference, results may prove to be wrong.

Class : 11th Economics (Statistics)
Chapter-1 : Introduction To Statistics



Important Questions

Multiple Choice questions-

1. Arthashashtra originated in:
   (a) 17th century
   (b) 18th century
   (c) 19th century
   (d) None of the above.
2. "Economics is the study of economic welfare" who said this:
   (a) Marshall
   (b) Prof. Pigou
   (c) J. K. Mehta
   (d) Keynes.
3. He is known as father of statistics:
   (a) Bowley
   (b) Bodington
   (c) Gottfried Achenwall
   (d) None of these.
4. Statistics is:
   (a) Facts
   (b) Presentation
   (c) Numerical data
   (d) None of these.
5. Name of the book by Kautilya:
   (a) Economics
   (b) Varta
   (c) Krishna, Valmiki and Vashista
   (d) None of these.

Fill in the blanks:

1. Adam Smith is known as …… of Economics.

2. There is difference between wants and .....
3. Collection is an example of .....
4. Statistics is an art as well as .....
5. When six economists gather they have ..... opinion.

State true or false:

1. There are limited wants of humans.
2. "Principles of Economics" is written by Pigou.
3. Statistical data is numerical data.
4. Statistics is not important in speculation market.
5. Rules of economics are universal.

Match the columns:

Column A	Column B
1. Optional use of limited resources	(a) Pigou
2. Money is a measuring source	(b) Bowley
3. Statistics is the science of counting	(c) Robbins
4. Collection of data	(d) Samuelson
5. Development related definition of economics	(e) Primary and secondary data.

Very Short Questions:

1. According to Marshall, Economics is what type of science?
2. Who wrote the book, "Discovery of Nation's Wealth and Reasons"?
3. What is statistics in singular?
4. Who gave analytical definition of economics?
5. From which language statistics has been derived?
6. What are economic goods?
7. Who is propagator of modern economics?

8. Who is known as service provider?
9. Who is known as service man?
10. What is economic activity?

Short Questions:

1. Define statistics.
2. What are the stages of statistical study?
3. What are the tools used, related to statistical study?
4. What are the scopes of statistics?
5. Define statistics as a singular noun.
6. Define statistics as a plural noun.
7. What is inferential statistics?
8. What are the two components of the subject matter in statistics?
9. What are the three components of economics?
10. What is descriptive statistics?

Long Questions:

1. What is Economic Activity?
2. What is statistics?
3. What are Statistical Tools?
4. Subject Matter of Statistics?
5. Limitations of Statistics?
6. What Causes Distrust?

ANSWER KEY

Multiple Choice Answers-

1. (b) 18th century
2. (a) Marshall
3. (b) Bodington
4. (b) Presentation
5. (a) Economics

Fill in the blanks:

1. Father

2. Intensity
3. Statistics
4. Science
5. 7

State true or false:

1. False
2. False
3. True
4. False
5. False

Match the columns:

Column A	Column B
1. Optional use of limited resources	(c) Robbins
2. Money is a measuring source	(a) Pigou
3. Statistics is the science of counting	(b) Bowley
4. Collection of data	(e) Primary and secondary data.
5. Development related definition of economics	(d) Samuelson

Very Short Answers:

1. Social
2. Adam Smith
3. Rules
4. Robbins
5. English
6. The goods which are made by humans are called economic goods.
7. The propagator of modem economics is Prof. Marshall.

8. The person who works for others for remuneration is called service provider.
9. The person who keep others to do his work for remuneration is called service man.
10. Activities which are performed to earn wealth are called economic activities.

Short Answers:

1. Statistics can be defined as the collection, presentation, classification, analysis, and interpretation of quantitative data.
2. The stages of a statistical study are:
   - Collection of data
   - Organisation of data
   - Presentation of data
   - Analysis of data
   - Interpretation of data
3. The tools used, related to statistical study are:
   - Census or sample technique
   - Tally bar and assembling of data
   - Graphs, tables, and diagrams
   - Average, percentages, regression coefficient, and correlation
   - Average and the degree of relation, percentage, and relation between degree variables
4. The scopes of statistics include:
   - Nature of statistics
   - Subject matter of statistics
   - Limitation of statistics
5. In the singular sense, statistics means the science of statistics or statistical methods. It refers to the techniques or methods relating to the analysis, collection, presentation, classification, and interpretation of quantitative data.
6. In the plural sense, statistics is defined as the information in terms of numerical data or numbers such as employment statistics, statistics concerning public expenditure, population statistics, etc.
7. Inferential statistics refers to the methods by which conclusions are drawn relating to the universe based on a given sample.
8. The two components of the subject matter in statistics are:
   - Descriptive statistics
   - Inferential statistics

9. The three components of economics are consumption, production, and distribution.

10. Descriptive statistics refers to those methods which are used for the collection, presentation as well as analysis of data. These methods relate to such estimations as a measurement of central tendencies, measurement of dispersion, measurement of correlation, etc.

Long Answers:

1. It is an activity which is related to the use of scarce means (also called scarce resources).

   Means are always scarce in relation to our wants. Imagine yourself as the richest person on the earth. Still you can't have everything you wish to have at a point of time. It implies the scarcity of your means/ resources in relation to your wants.

   Engaged in diverse economic activities, we are performing 'ordinary business of life', according to Alfred Marshall, a great pro founder of Modern Economics. Thus, he defines economics as "the study of mankind in the ordinary business of life."

   Scarcity is the Undercurrent of Economic Problem and therefore of Economics

   Resources are always scarce in relation to our wants. Also, resources have alternative uses: A ten-rupee note in your pocket may be spent on a cup of coffee or a cold drink. Likewise, a worker may render his services in factory A, rather than B and C. Because, resources are scarce and have alternative uses, we cannot escape from the problem of allocation of limited means to alternative uses. This is what we call economic problem or the problem of choice.

2. Even to a layman this should not be a difficult question. If asked to define Statistics, we can expect a layman to say that Statistics is something like a store of quantitative information. Yes, it is true. Statistics means quantitative information or quantification of the facts and findings. But, how do we get quantitative information? There must be a system, method or technique to collect quantitative information. Also, statistical information may be a raw information. It needs to be classified, tabulated or it needs to be systematically presented. One must learn the system of presentation and classification of data. Also, there must be a set of methods and techniques to condense the data. May be, we find averages or percentages. And above all, there must be a set of methods or techniques on the analysis and interpretation of quantitative information. A student of economics has to study all these methods and techniques to understand and master the subject matter of Statistics.

   Thus, unlike a layman, a student of economics cannot relax taking Statistics just as a pool of quantitative information. Instead he is also to look into the methods or techniques relating to its collection, classification, presentation, analysis as well as interpretation.

   In view of such a vastness of the subject matter, Statistics is defined both in singular sense and plural sense, as under:

   Statistics—A Plural Noun

In its plural sense, Statistics refers to information in terms of numbers or numerical data, such as Population Statistics, Employment Statistics, Statistics concerning Public Expenditure, etc. However, any numerical information is not Statistics. Example: Ram gets Rs. 100 per month as pocket allowance is not Statistics (it is neither an aggregate nor an average) whereas average pocket allowance of the students of Class X is Rs. 100 per month, or there are 80 students in Class XI compared to just 8 in Class XII of your school are Statistics.

The following table shows a set of data which is Statistics, and another set which is not Statistics. The figures used are hypothetical.

Data which are not Statistics	Data which are Statistics
(i) A cow has 4 legs.	(i) Average height of the 26-plus male people in India is 6 feet compared to 5 feet in Nepal.
(ii) Ram has 200 rupees in his pocket.	(ii) Birth rate in India is 18 per thousand compared to 8 per thousand in USA.
(iii) A young lady was run over by a speeding truck at 100 km per hour.	(iii) Over the past 10 years, India has won 60 test matches in cricket and lost 50.

3. These refer to the methods or techniques used for the collection, organisation and presentation of data, as well as for the analysis and interpretation of data.

Stages of Statistical Study and the Related Statistical Tools

Stages	Statistical Study	Statistical Tools
Stage I	Collection of Data	Census or Sample Techniques
Stage II	Organisation of Data	Array of Data and Tally Bars
Stage III	Presentation of Data	Tables, Graphs and Diagrams
Stage IV	Analysis of Data	Percentages, Averages, Correlation and Regression Coefficients
Stage V	Interpretation of Data	Magnitude of Percentages, Averages and the Degree of Relationship between different economic variables

4. Subject Matter of Statistics

Subject matter of statistics includes two components: Descriptive Statistics and Inferential Statistics.

The Concept of Universe or Population

It should be interesting for the students of Clsss XI to note that the concept of universe or population has a specific meaning in Statistics. It refers to the aggregate of all items or units relating to your statistical study. Example:

Universe or population size is 1,000 if you are studying 1,000 students for your statistical study.

(1) **Descriptive Statistics:** Descriptive Statistics refers to those methods which are used for the collection, presentation as well as analysis of data. These methods relate to such estimations as 'measurement of central tendencies' (average mean, median, mode), 'measurement of dispersion' (mean deviation, standard deviation, etc.), 'measurement of correlation', etc. Example: Descriptive statistics is used when you estimate average height of the secondary students in your school. Likewise, descriptive statistics is used when you find that marks in science and mathematics of the students in all classes are intimately related to each other.

(2) **Inferential Statistics:** Inferential Statistics refers to all such methods by which conclusions are drawn relating to the universe or population on the basis of a given sample. (In Statistics, the term universe or population refers to the aggregate of all items or units relating to any subject.) For example, if your class teacher estimates average weight of the entire class (called universe or population) on the basis of average weight of only a sample of students of the class, he is using inferential statistics.

5. In modern times. Statistics has emerged to be of crucial significance in all walks of life. However, it has certain limitations. Thus, writes Newshome that, "Statistics must be regarded as an instrument of research of great value but barring severe limitations which are not possible to overcome." Following are some notable limitations of Statistics:

(1) Study of Numerical Facts only: Statistics studies only such facts as can be expressed in numerical terms, it does not study qualitative phenomena like honesty, friendship, wisdom, health, patriotism, justice, etc.

(2) Study of Aggregates only: Statistics studies only the aggregates of quantitative facts. It does not study statistical facts relating to any particular unit. Example: It may be a statistical fact that your class teacher earns Rs. 50,000 per month. But, as this fact relates to an individual, it is not to be deemed as a subject matter of Statistics. However, it becomes a subject matter of Statistics if we study income of school teachers across all parts of the country, for purpose of finding regional differences in income.

(3) **Homogeneity of Data, an essential Requirement:** To compare data, it is essential that statistics are uniform in quality. Data of diverse qualities and kinds cannot be compared. For example, production of food grains cannot be compared with the production of cloth. It is because cloth is measured in meters and food grains in tonnes. Nevertheless, it is possible to compare their value instead of the volume.

(4) **Results are True only on an Average:** Most statistical findings are true only as averages. They express only the broad tendencies. Unlike the laws of natural sciences, statistical observations are not error-free. They are not always valid under all conditions. For instance, if it is said that per capita income in India is Rs. 50,000 per annum, it does not mean that the income of each and every Indian is Rs. 50,000 per annum. Some may have more and some may have less,

(5) **Without Reference, Results may Prove to be Wrong:** In order to understand the conclusions precisely, it is necessary that the circumstances and conditions under which these conclusions have been drawn are also studied. Otherwise, they may prove to be wrong.

(6) **Can be used only by the Experts:** Statistics can be used only by those persons who have special knowledge of statistical methods. Those who are ignorant about these methods cannot make sensible use of statistics. It can, therefore, be said that data in the hands of an unqualified person is like a medicine in the hands of a quack who may abuse it, leading to disastrous consequences. In the words of Yule and Kendall, "Statistical methods are most dangerous tools in the hands of an inexpert."

(7) **Prone to Misuse:** Misuse of Statistics is very common. Statistics may used to support a pre-drawn conclusion even when it is absolutely false. It is usually said, "Statistics are like clay by which you can make a god or a devil, as you please." Misuse of statistics is indeed its greatest limitation.

6. Distrust of Statistics arises not because there is anything wrong with Statistics as a subject matter. It arises because the users of Statistics tend to manipulate it to suit or support their pre-drawn conclusions or observations. Main causes for the distrust of Statistics are as under:

(i) Different kinds of Statistics are obtained in respect of a given problem.

(ii) Statistics can be altered to match the predetermined conclusions.

(iii) Authentic Statistics can also be presented in such a manner as to confuse the reader.

(iv) When Statistics are collected in a partial manner, the results are generally wrong. Consequently, people lose faith in them.

However, it may be noted that if Statistics are presented wrongly, then the fault does not lie with Statistics as a subject matter. The fault lies with those people who collect wrong Statistics or those who draw wrong conclusions. Statistics, as such, do not prove anything. They are simply tools in the hands of the statisticians. If a statistician misuses the data, then the blame lies squarely on him and not on the subject matter, A competent doctor can cure a disease by making good use of the medicine but the

same medicine in the hands of an incompetent doctor becomes a poison. The fault in this case is not of the medicine but of the unqualified doctor. In the same way, Statistics is never faulty but the fault lies with the users.

In fact, Statistics should not be relied upon blindly nor distrusted outright. “Statistics should not be used as a blind man uses a lamp post for support rather than for illumination, whereas its real purpose is to serve as illumination and not as a support.”

In making use of Statistics one should be cautious and vigilant. In the words of King, “The science of Statistics is the most useful servant, but only of great value to those who understand its proper use.”

It is the duty of the students of economics to make use of know-how of Statistics to discover the truth rather than to cover the truth.